JULY, 1959

Commercial Fertilizer

and PLANT FOOD INDUSTRY

CASH IN
ON THE TREND
TO N

SEE PAGE 19

Advertisement of NITROGEN DIVISION, ALLIED CHEMICAL

KRAFT BAG CORPORATION, through correct construction of your multiwall shipping sacks, will reduce seepage and spoilage of contents while minimizing your shipping and storage problems.

If your product fits into a bag –
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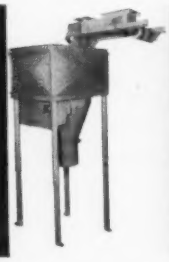
Gummed Tape Div.
The Gilbarco Corp.
Kraft Bag Corp.

KRAFTPACKER



☐ We are interested in improving our bag.
☐ We are interested in your Kraftpacker.

CF

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CITY_____ ZONE____ STATE_____ PRINCIPAL_____

PRODUCT MFD._____

SMIROW is the favorite natural organic of fertilizer manufacturers and farmers-and has been since 1921.

ONE HUNDRED PER CENT natural organic, uniform in texture and color, excellent mechanical condition, dust free – that is SMIROW tankage. There is no substitute for SMIROW's combination of benefits for fertilizer manufacturers and farmers.

Used in mixed fertilizers or applied direct, SMIROW provides sustained, even-feeding for that all-season effect on plant growth. SMIROW is not a synthetic — but 100 percent natural organic.

Put more customer benefits in your fertilizer
—add to its selling power—with SMIROW tankage, the 100 percent natural organic nitrogen.
Let us figure the cost of SMIROW delivered to your plant.

SMITH SMIROW ROWLAND

SMITH-ROWLAND CO.

P. O. BOX 1219, NORFOLK 1, VA.

A DIVISION OF SMITH-DOUGLASS, INCORPORATED

FULL ORBIT

INTERNATIONAL'S service concept helps you sell more fertilizer... profitably!

International's exclusive Full Orbit Service program is helping hundreds of fertilizer manufacturers turn better profits — through impoved business techniques.

Planned as a market-building program which rests on the use of professional management methods by fertilizer manufacturers, Full Orbit Service is put into effect by individual International salesmen.

Drawing on the talents of experts in many fields, your International salesman becomes the route to manufacturing and merchandising success for companies not needing the full-time services of highly-skilled specialists.

How does it work? The Full Orbit program is a free service of the International Minerals & Chemical Corporation. Customers of International who have problems in Sales Management, Transportation, Manufacturing, Credit and Collection, Insurance, or Advertising are invited to discuss opportunities for improvement with their International representative.

Getting the answers from Full Orbit's extensive library, or direct from experts in many specialized areas, then becomes the responsibility of International.

Why International? The project was approached much as you would do it. It was based *not* on the belief that we are "smarter" than anyone else . . . but on the conviction that it *is* a responsibility of IMC to help keep the fertilizer industry healthy, growing and profitable.

Working together for mutual gain is, then, the reason behind Full Orbit Service. The ideas and materials available through this program are ready to help you to improved business methods. Discuss your needs with your IMC man. He'll be glad to bring you new thoughts, new techniques, new stimulation for better operation.

Producers of Living Minerals

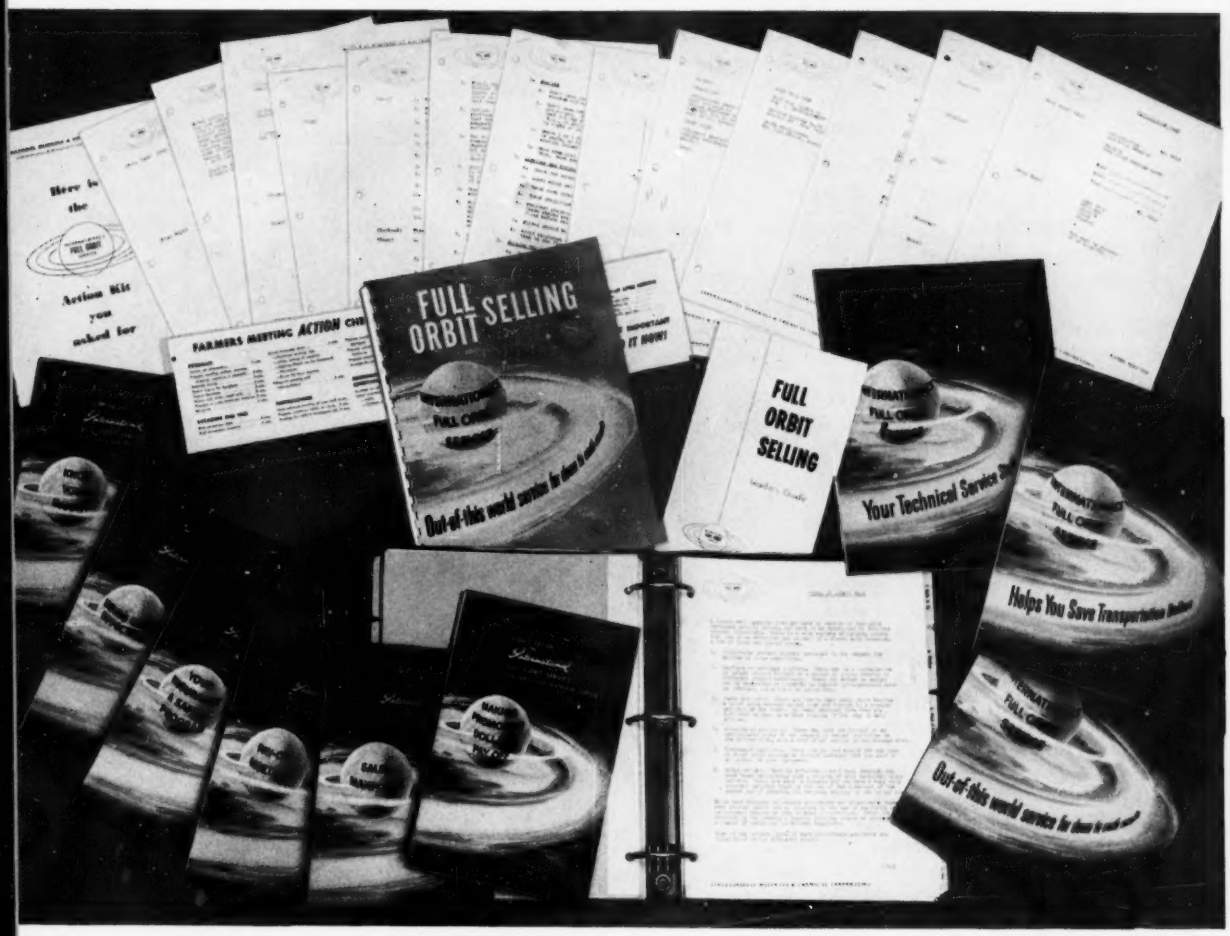
MINERALS International CHEMICALS

AGRICULTURAL CHEMICALS DIVISION

INTERNATIONAL MINERALS

Administrative Center — Skokie, Illinois

SERVICE...



Customer Assistance in:

Market Analysis • Sales Management • Sales Training • Sales Meetings
Advertising • Credit & Collections • Insurance • Safety
Transportation • Technical Service

& CHEMICAL CORPORATION

Phone ORchard 6-3000

Count on a Sohio contract to

Figure every nitrogen need in your favor

FIGURING your nitrogen requirements is often the difficult part of planning next year's program. But a Sohio contract ends much of the work and worry.

Sohio technical service personnel will help evaluate your past year's program. They'll help you plan production so you'll parallel industry trends . . . toward higher nitrogen complete fertilizers . . . or the use of supplemental nitrogen materials.

You'll have full flexibility in formulating, too, because Sohio offers a complete line of nitrogen solutions. Sohiogen solutions — containing varying combinations of ammonia, ammonium nitrate and urea — are blended to a wide range of chemical and physical properties. That's why Sohio can suggest the *one best solution* for your entire operation.

Important, too, with your requirements scheduled Sohio can plan production to meet your specific product needs and timetable to serve you even better.

Have the "Man from Sohio" explain how a Sohio contract for the coming year will benefit you by figuring every nitrogen need in your favor.

12-59

See Sohio first for high quality anhydrous ammonia — aqua ammonia — coated 45% or uncoated 46% urea — and 18 nitrogen solutions, including those containing urea.

SOHIO

. . . we're serious about SERVICE at Sohio

SOHIO CHEMICAL COMPANY

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Published Monthly by
WALTER W. BROWN PUBLISHING CO., INC.
75 Third St., N. W., Atlanta 8, Ga.
Phone TRinity 4-4160

Address all inquiries, advertising and editorial material, and correspondence to publishing offices in Atlanta, sending direct to COMMERCIAL FERTILIZER and PLANT FOOD INDUSTRY, 75 Third St. N. W., Atlanta 8, Georgia.

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Vol. 99, No. 1 *Established 1910* July, 1959

Commercial Fertilizer
and PLANT FOOD INDUSTRY

Subscription rates: United States, $3.00 per year; 5 years, $12.00.
Foreign $5.00 per year.

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SECOND-CLASS Postage paid at Atlanta, Georgia. COMMERCIAL FERTILIZER and PLANT FOOD INDUSTRY is published monthly except semi-monthly in September, by Walter W. Brown Publishing Co., Inc., 75 Third St., N. W., Atlanta 8, Georgia.

Commenting Freely

by BRUCE MORAN

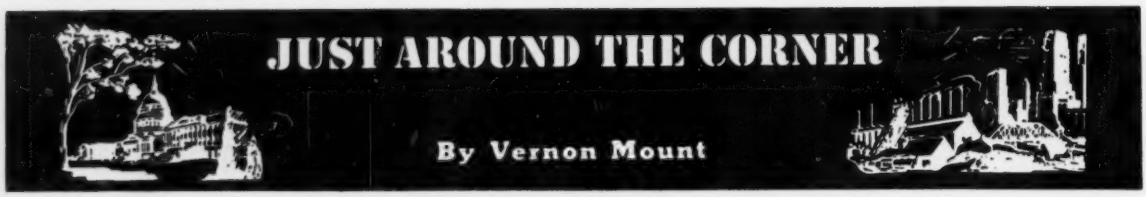
The trouble with averages is that they are so very average.

For example, you may have seen a statement that mechanization has not helped the farmer to a better net profit, as it was supposed to do. And, without digging too deep into the figures, this seems true.

The farmer, they say, had to double his indebtedness to $20,000,000,000 because his costs went up and he could not pass the added liability along to the consumer. And this is no doubt a fact.

But we note that bankers retain their enthusiasm for the mechanization of the right farms . . . and we judge that this is the real answer. The right farm can benefit by mechanization, — while the wrong farm must gradually slip out of the picture. It seems a little sad, but it is true — and there's no dodging the law of economics.

In one item we must all agree. There have been too many cooks in the mechanization program, giving the farmer too many different slants. The result, — each farmer rides off in all directions. This creates waste, and we of the fertilizer industry, with the largest interest in the subject, might well study the subject a bit closer.



CITY PEOPLE—except those with a direct interest in agriculture, and perhaps not too many of those, have no conception of the good work done by USDA. They are more likely to understand the work of the Land Grant Colleges, because these are closer to them, geographically and otherwise.

THE RESEARCH that goes on, from the lowly turnip to the double-breasted turkey, benefits agriculture in ways that cannot be measured in money, and that certainly should not be subject to complaint when budgets are established.

FROM GROWING TO MARKETING the work that is being done, and done capably, is worth many billions to the Nation as a whole, the city dweller, the farmer. There may be waste here and there. There may be incompetents here and there. But on the whole our agricultural aids are doing a job for us that we should appreciate.

IF WE, as a prime partner in agriculture, were doing our share of the research, the education and the marketing cooperation, it could mean so much more fertilizer business to every factor in the industry.

Yours faithfully,

Vernon Mount

BAY-SOL® NITROGEN SOLUTIONS
ANHYDROUS AMMONIA
AMMO-NITE® AMMONIUM NITRATE FERTILIZER — 33.5% NITROGEN

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CHASETITE tape-over-sewn-closures

...provide a perfect TOP-AND-BOTTOM moisture barrier

WHAT IT IS . . . HOW IT WORKS

Using a special tape, adhesive, and method of application, CHASETITE closes a bag with the most positive seal known! Gives a perfect bond, even with dust particles on the tape. It is impossible to tear the CHASETITE closure off a bag without pulling part of the outer bag ply with it. Seals from tape end to tape end—firmly sealing the ends extending beyond the bag surface.

Applies at such speed that heat won't scorch paper or melt a poly-coated inner sheet! (No reduction in bag filling speed is required). Airborne moisture doesn't penetrate needle holes, ends risk of "pencil-line" hardening of material at the closure.

Contact your local Chase representative, or write today:

The stubborn problem of moisture penetration through bag closures has been licked once and for all. Now, you can specify Chase Multiwalls with CHASETITE heat-bonded tape-over-sewn *bottom* closure . . . and you can moisture-proof the *top* closure right in your own plant simply by installing the low-cost, money-saving CHASETITE unit. Your compact, new CHASETITE unit pays for itself by reducing adhesive waste, and assuring top protection against ruinous moisture pick-up. Installs on existing conveyors, needs only 2 feet board space. Prices and installation diagram on request.

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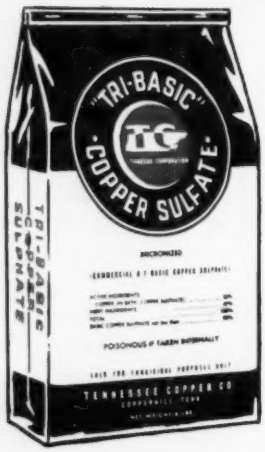
TRI-BASIC (MICRONIZED) COPPER

The Versatile Fungicide



You get so many more advantages with Copper fungicides — used as a spray or dust on practically all truck crops in the control of persistent fungus diseases — Tri-Basic provides control of citrus and grape diseases, also on many deciduous fruits — Tri-Basic has excellent adherence qualities and protects longer — lower disease control cost, greater yield of top quality produce.

TRI-BASIC COPPER SULFATE
Quality Controlled from Mine to Finished Product

For further information please make requests on your company's letterhead.

Is there another Fungicide offering these advantages?

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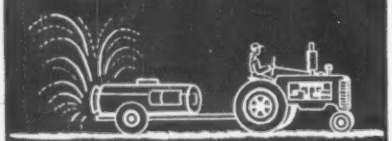
- Easy to Apply
- Economical
- Upgrades Quality of Fruits & Vegetables
- Longer Shelf Life
- Corrects Copper Deficiencies
- Effective Control
- Always Dependable
- Compatible
- Plentiful Supply



TENNESSEE CORPORATION
617-629 Grant Building, Atlanta 3, Georgia

Stewart succeeds Bennett at NPFI helm

J. D. Stewart, Jr.

Richard E. Bennett

Key To Pictures

1. Mr. & Mrs. P. G. Aryan, Monsanto Chemical Co., St. Louis, and Bert Tucker, Sohio Chemical Co., Lima, O.
2. Charlie Woodcock, St. Regis Paper Co., New York, and Phil Stocker, Land O' Lakes Creameries, Minneapolis.
3. A. A. Kanimtula, Fertilizer Assn. of India, New Delhi, and Russell Coleman, National Plant Food Institute, Washington.
4. Justin Potter, Virginia-Carolina Chemical Corp., Richmond, and Louis C. Wilson, NPFI, Washington.
5. J. Fielding Reed of Atlanta, and H. B. Mann of Washington, both with American Potash Institute.
6. Ralph Fraser, Summers Fertilizer Co., Baltimore; Sam Clement, Monsanto Chemical Co., St. Louis; and Joe Wright, Texas Farm Products Co., Nacogdoches, Texas.
7. R. P. Bond, Stauffer Chemical Co., Houston; E. K. Ludington, Jr., Chase Bag Co., New York.
8. John Cox of Birmingham, and Hal Johnson of New York, both with Continental Can Co.
9. Ralph B. Douglass, Smith-Douglass Co., Norfolk, and C. W. Baldwin, U. S. Steel, Pittsburgh.
10. Dick Goldthwaite, Monsanto Chemical Co., St. Louis; J. A. Monroe, Smith-Douglass Co., Norfolk; Trenton Tunnell, Ashcraft-Wilkinson Co., Atlanta.
11. Oliver W. Terhune, Terre Co., Rochelle Park, N. J., and Jack Ullman, DuPont, Wilmington.
12. W. B. Gillette, Texas Gulf Sulphur Co., New York, and R. P. Bond, Stauffer Chemical Co., Houston.

J. D. Stewart, Jr., president of Federal Chemical Co., Louisville, Ky. was elected to the presidency of National Plant Food Institute at a meeting of the new board of directors following the Institute's annual convention at White Sulphur Springs, W. Va. June 14-16.

Richard E. Bennett, president of Farm Fertilizers, Omaha, Nebr., and immediate past president of NPFI, was elected chairman of the board of directors to succeed L. Dudley George of Richmond Guano Co., Richmond, Va.

Other officers, all of Washington, D. C., were re-elected as follows: Paul T. Truitt and Russell Coleman, executive vice presidents; W. Raoul Allstetter, vice president; Louis H. Wilson, secretary; William S. Ritnour, treasurer.

Members of the executive committee elected are: Ralph B. Douglass, Smith-Douglass Co., Norfolk, Va.; John W. Hall, Potash Co. of America, Washington; Stanley S. Learned, Phillips Petroleum Co., Bartlesville, Okla.; Justin Potter, Virginia-Carolina Chemical Corp., Richmond, Va.; C. T. Prindeville, Swift & Co., Chicago; W. E. Shelburne, Armour Agricultural Chemical Co., Atlanta, Ga.; Jacob White, Nitrogen Division, Allied Chemical Corp., New York; and Mr. Bennett and Mr. Stewart.

L. M. Roberts of the Ammonia Division, Shell Chemical Corp., San Francisco, was elected to the board of Directors to fill the unexpired term of G. R. Monkhouse, whose term expires June 1961.

Twelve new members were elected to the board of directors for terms expiring in June 1962. They are: B. H. Brewster, Jr., Baugh & Sons Co., Baltimore; J. C. Denton, Spencer Chemical Co., Kansas City; James F. Doetsch, Chilean Nitrate Sales Corp., New York; Marlin G. Geiger, W. R. Grace & Co., New York; E. A. Geoghegan, Southern

Cotton Oil Division, Wesson Oil & Snowdrift Co., New Orleans; L. D. Hand, Pelham Phosphate Co., Pelham, Ga.; John W. Hall, Potash Co. of America, Washington; E. R. Jones, Hubbard-Hall Chemical Co., Waterbury, Conn.; G. H. Kingsbury, Kingsbury & Co., Indianapolis; J. J. Lanter, Central Farmers Fertilizer Co., Chicago; C. T. Prindeville, Swift & Co., Chicago; and Tom Wright, Texas Farm Products Co., Nacogdoches, Texas.

Fair weather favored the three-day convention, which attracted about 950 representatives of the fertilizer industry to the Greenbrier Hotel. Sunday, initial day of the convention, was given over to registration, committee meetings, a ladies garden party, and just visiting.

Business sessions were held Monday morning and Monday afternoon, and the nitrogen producers were hosts at a hospitality hour before dinner that evening. The ladies enjoyed a tour of the hotel facilities and a presentation by Mr. John, well-known designer of ladies' hats, followed by a bridge and canasta party that afternoon.

There was another business session Tuesday morning, an early evening hospitality hour through courtesy of the potash producers, and the annual banquet that evening to conclude the convention.

Between hours in the busy schedule, there were men's and ladies' golf tournaments, tennis matches, horseshoe pitching and skeet shooting contests.

The forenoon business meeting on Monday was chairmanned by President Richard E. Bennett, who led off with his report of NPFI's objectives, organization and program. He told the audience that about 90% of the Institute's budget is spent for research and education—in an effort to gain greater market penetration and make a bigger market for the industry. The remaining 10%, he said, goes to support NPFI's work in governmental affairs.

Mr. Bennett outlined the workings of the Institute's expanded program of activities, authorized by the membership two years ago and in a fully operational phase for the past year. Good results are beginning to be apparent, he stated, and cited the reports of NPFI regional directors which followed his talk.

The panel, "NPFI on the Move," was moderated by Russell Coleman, executive vice president of the Institute.

Richard B. Bahme, western regional director, led off with the topic of "Spreading the Word About Fertilizer." Due to the newness of fertilizer use in many areas of the West, he said, one of the principal aspects of the program there was to create an awareness of the importance of fertilizer and to enhance the prestige of the industry. One effort in this direction was a tour of chemical fertilizer plants and materials factories conducted for farm magazine and college editors, bankers and college personnel. Another was a series of farm advisor schools and plant tours. Similar schools for bankers are planned for later this year, he added, along with many state-level projects. At the same time, he concluded, all this activity is selling the economic benefits of proper fertilization and high soil fertility.

The Midwest regional director, Zenas H. Beers, cited the opportunity that exists in "Raising Farmers' Sights" as to what they can do for themselves with fertilizer and good farming methods. Stating a belief that most Midwest farmers, while familiar with fertilizer, either do not realize the productive capacity of their soils or do not have confidence in their own ability to achieve this productive capacity. He described NPFI's Midwest program of working with land grant colleges to prepare, publish and publicize data on the soil capacities in the area. Eight midwestern colleges are now in a position to furnish this information for sales development goals, he pointed out.

Before farmers can be convinced of this potential, Mr. Beers concluded, the industry must first convince fertilizer salesmen and dealers of the opportunity that remains, and this also is an aim of the program in the Midwest.

Declaring that soil fertility programs are the "open sesame" to an improved agriculture for the South, Samuel L. Tisdale, southeastern regional manager for the Institute, discussed the "Intensified Approach to the Fertilizer Market," telling of the success achieved in a number of local all-out promotions where the entire community was lined up behind the program to increase local farm output. Bankers, civic organizations, businessmen and mass me-

Key To Pictures

1. Jim Hildreth, A & M College of Texas, Lubbock; Dr. & Mrs. Sam Tisdale, NPFI, Atlanta; Leonard D. Baver, Hawaiian Sugar Planters Assn., Honolulu.
2. Charles F. Martin, Miami Fertilizer Co., Dayton, O., and G. J. Carney, International Minerals & Chemical Corp., Skokie, Ill.
3. Mrs. Bert Roper, Mrs. George Barley, Bert Roper and George Barley, Diamond R Fertilizer Co., Winter Garden, Fla.
4. Bill Hewitt, Bunker Hill Co., San Francisco; Art Wilkinson, Consolidated Mining & Smelting Co., of Canada, Montreal; Ben McCollum, J. R. Simplot Co., Pocatello, Idaho.
5. Gene Van Deren, Bluegrass Plant Foods, Cynthiana, Ky.; Jim Turner, U. S. Borax & Chemical Co., Knoxville, Tenn.; Werner Nelson, American Potash Institute, Lafayette, Ind.; and Morris Newman, Price Chemical Co., Louisville.
6. Graham Campbell, Independent Mfg. Co., Philadelphia; Joe Prosser, A. J. Sackett & Sons Co., Baltimore; and Bryant Cooper, Home Guano Co., Mullins, S. C.
7. Sam Clement, Monsanto Chemical Co., St. Louis, and Archie Edwards, Red Star Fertilizer Co. Div., Sulphur Springs, Texas.
8. Henry Coleman, Sohio Chemical Co., Lima, O.; R. R. Zurbuchen, Coop. Farm Chemicals, Lawrence, Kans.; and Angus Taylor, Chemical & Industrial Corp., Cincinnati.
9. Mrs. Edward Block, Joliet, Ill.; Mrs. William B. Copeland, Little Rock; and Mrs. Frank Lavery, New York.
10. W. F. Jacobi, Union Bag - Camp Paper Corp., New York; Mr. & Mrs. W. M. Campbell, Dixie Guano Co., Laurinburg, N. C.; and Gene Cartledge, Union Bag-Camp Paper, Norfolk.
11. Sid Keel, International Minerals & Chemical Corp., Skokie, Ill.; and Andy Farrell, Virginia-Carolina Chemical Corp., Richmond.
12. Mr. & Mrs. A. H. Bowers, Swift & Co., Chicago; Dr. & Mrs. Ed Kapusta, U. S. Potash Div., New York.
13. Jim Naftel, U. S. Borax & Chemical Corp., Auburn, Ala.; Charlie Harding, Virginia-Carolina Chemical Corp., Richmond, Va.; and Jim Britton, U. S. Potash Co., Div., Auburn.
14. Zenas Beers, NPFI, Chicago; Mr. & Mrs. Bruce Cloaninger, Assn. of American Fertilizer Control Officials, Clemson, S. C.; and R. P. Thomas, International Minerals & Chemical Corp., Skokie, Ill.
15. T. S. L. Pope, Quebec, Que., Canada; Bill Chadwick, International Minerals & Chem. Corp., New York, and V. B. Lillie, Canadian Industries Ltd., Montreal.
16. Mr. and Mrs. H. E. Wood, Farmers Fertilizer Co., Columbus, O.
17. Mr. & Mrs. Sam Hardwick of Richmond, Va., and W. W. Wilson of Wheaton, Ill., all with U. S. Potash Co. Div.
18. Dick Bennett, Farm Fertilizers, Omaha; Mr. & Mrs. George Walton, Tennessee Corp., Lockland, O.
19. Gene Van Deren, Bluegrass Plant Foods, Cynthiana, Ky.; T. E. Bradley, Potash Co. of America, Peoria, Ill.; and Jack Snyder, Snyder Chemical Co., Topeka, Kansas.
20. R. P. Thomas, International Minerals & Chemical Corp., Skokie, Ill.; Mr. & Mrs. Bert Carvel, Valliant Fertilizer Co., Laurel, Del.
21. Mrs. Leroy Donald, St. Louis; Mrs. Richard E. Bennett, Council Bluffs, Iowa; and Mrs. Dick Goldthwaite, St. Louis.
22. Mr. & Mrs. Dick Goldthwaite, Monsanto Chemical Co., St. Louis.
23. Mrs. Earl Day and Mrs. Laney Black, Corning, Ark.; and Mrs. Jack Garvin, St. Louis.
24. Mr. & Mrs. W. H. Appleton, Potash Co. of America, Atlanta.
25. Eugene German, Duval Sulphur & Potash Co., Houston, and F. L. Litty, Northern Chemical Industries, Searsport, Me.
26. John Garvin, Monsanto Chemical Co., St. Louis; Ed Crouse, C D Liquid Fertilizer Co.; Liberty, Ind.; and Ed Aylward, Aylco Liquid Fertilizer Co., Sullivan, Ill.
27. T. E. Camp, Jr., Southwest Potash Corp., New York, and J. E. Moore, Armour Agricultural Chemical Co., Atlanta.
28. George Cosper, Sohio Chemical Co., Lima, O.; and Mr. & Mrs. W. P. Dean, Swift & Co., Chicago.
29. Ed Smith, Potash Co. of America, Washington; Mrs. Vernon Bishop, Lebanon, Pa.; George Belicka, Jr., American Process Co., Lebanon; Vernon Bishop, Lebanon Chemical Corp., Lebanon.
30. Kenneth D. Morrison, Philipp Bros. Co., New York; John S. Neild, Jr., Dorchester Fertilizer Co., Cambridge, Md.,; and Tom Morrison, Philipp Bros., New York.
31. L. H. Wright, Phillips Petroleum Co., Bartlesville, Okla.; Mr. & Mrs. Angus Taylor, Chemical & Industrial Corp., Cincinnati.
32. George Klein, Davison Chemical Co., Baltimore; Lowell Berry, Best Fertilizers Co., Lathrop, Calif.
33. Ray White, Spencer Chemical Co., Kansas City; Mr. and Mrs. W. G. Brookman, Prairie Farmer magazine, Chicago.

dia were all urged to join the push, he explained, on the premise that a boost in local farm income would benefit everyone in the community.

Soil testing was the first step in each county-wide campaign, Dr. Tisdale explained, with proper liming and fertilization as the prime goal. In the six-county Georgia area where the program was initiated, he said, gross fertilizer tonnage rose 10.1%, plant nutrients rose 17.5% and liming increased over 300%. Similar programs are now under way in more than 69 counties in seven southeastern states, with more coming up. While these programs are conceived and carried out entirely by local people, he stated, the Institute lends a great deal of support to the undertaking.

R. A. King, professor of agricultural economics at North Carolina State College, presented a modern formula for predicting, one year in advance, plant food use in the United States. He said that, when ap-

Key To Pictures

1. Dick Bennett, Farm Fertilizers, Omaha; Ed Kolb, American Potash & Chemical Corp., New York; Russell Martin, Miami Fertilizer Co., Dayton, O.; Tom Ware International Minerals & Chemical Corp., Skokie, Ill.

2. Joe Wright, Texas Farm Products Co., Nacogdoches; Dave Stark and Len Gopp, International Minerals & Chemical Corp., Skokie, Ill.

3. W. J. F. Francis, American Potash & Chemical Corp., Los Angeles; Mr. & Mrs. C. L. Straughn, American Potash & Chemical Corp., Atlanta; Beverly Jones, Sunland Industries, Fresno, Calif.

4. Walter Sackett of the A. J. Sackett & Sons Co., Baltimore; Mike Sackett and Mrs. Sackett.

5. Bob Linderman, International Minerals & Chemical Corp., Skokie, Ill.; Mr. & Mrs. Clyde T. Marshall, Commercial Solvents Corp., New York; Mr. & Mrs. J. D. Stewart, Jr., Federal Chemical Co., Louisville.

6. Mr. & Mrs. J. R. Clements of Middletown, O., and Tom Athey of Baltimore, all with Raymond Bag. Corp.

7. Ed Smith, Potash Co. of America, Washington; Mrs. Vernon Bishop, Lebanon, Pa.; George Belicka, Jr., American Process Co., Lebanon; Virginia Crenshaw, Commercial Fertilizer, Atlanta; Bob Lenhart, Potash Co. of America, Glen Rock, N.J.; Mrs. Ed Smith, Washington.

8. Mr. & Mrs. Bob Christianson, Arkansas Farmer, Little Rock; Dr. & Mrs. Leo E. Orth, Sinclair Petrochemicals, Chicago.

9. Mrs. William M. Campbell, Laurinburg, N. C.; Mrs. Steele Wright, Jr., Nacogdoches, Texas; Mrs. Tom Smith, St. Louis; and Mrs. Edwin Pate, Laurinburg, N. C.

10. Mr. & Mrs. I. D. Barclay, Chamberlain & Barclay, Cranbury, N.J.; T. C. Rogers, Nitrogen Div., Allied Chemical Corp.

11. Mrs. John Perryman, Newnan, Ga.; Mrs. Gene Van Deren, Cynthiana, Ky.; Mrs. C. G. Thompson and Mrs. Jack Rutland, Waynesville, N. C.

12. Mr. & Mrs. Paul T. Truitt, NPFI, Washington; Mr. & Mrs. John R. Taylor, Jr., Grand River Chemical Div., Pryor, Okla.

13. Mr. & Mrs. J. H. Epting and Mr. & Mrs. R. W. Owen, Epting Distributing Co., Leesville, S. C., and Mrs. Russell Coleman, Washington.

14. Mr. & Mrs. L. A. Rhodes, and Mr. & Mrs. Harold Krueger, Stedman Foundry & Machine Co., Aurora, Ind.

15. Mrs. J. A. Glatthaar, St. Louis; Mrs. Paul T. Truitt and Mrs. Russell Coleman, Washington; Mrs. Sam Clement and Mrs. P. G. Arvan, St. Louis.

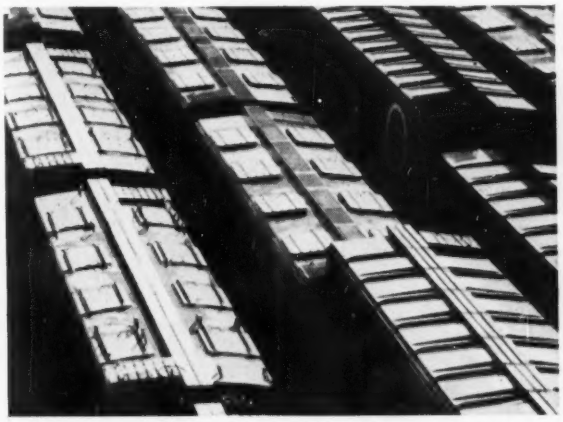
16. Mr. & Mrs. Peter G. Arvan, and Mr. & Mrs. J. E. Crawford, Jr., Monsanto Chemical Co., St. Louis.

Team up Cyanamid's phosphate products and services for superior mixed fertilizers, economically produced

At Brewster, Florida, Cyanamid mines high grade phosphate rock and manufactures quality TREBO-PHOS* Triple Superphosphate and phosphoric acid.

Add to these fine products Cyanamid's technical and traffic service and you've got an unbeatable combination. Here are a few of the ways Cyanamid helps you manufacture better mixed fertilizers for less money.

Product quality — Porosity of magnified (30x) TREBO-PHOS granule shows why it ammoniates up to 5% without evolution of fumes. Porosity is *controlled;* TREBO-PHOS does not pick up moisture readily, produces a dry, drillable, well-conditioned fertilizer.



Shipping service — Cyanamid traffic experts are experienced at routing phosphate shipments to eliminate avoidable delays. Your plant keeps humming along on schedule. This service is yours when and as you desire it.

Product planning — Cyanamid Technical Service personnel have country-wide experience in formulation and manufacture of mixed fertilizers at lowest cost. Often, what may be new problems for you, are solved problems for them.

Manufacturing assistance — Cyanamid people are versatile. They work where you work, help you get more out of your facilities. Often, they have suggested changes in procedure that have resulted in better mixed goods, produced more economically.

*TRADEMARK

To manufacture fertilizers that sell...
mix with Cyanamid's Phosphates and Service

TREBO-PHOS* TRIPLE SUPERPHOSPHATE | PHOSPHATE ROCK | PHOSPHORIC ACID

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PHOSPHATE PRODUCTS

American Cyanamid Company, Phosphates and Nitrogen Department, N. Y. 20, N. Y.

plied to the last 46 years, the formula produced results which closely coincide with actual consumption. He presented a progress report on a project, supported by the Institute, designed to develop a method for predicting fertilizer sales in advance.

"The State College-developed method, applied to 1957-58, gave a predicted consumption of 6,462,000 tons compared with actual use of 6,358,000 tons," Dr. King stated, adding that "the formula-produced estimate was within 1.6 per cent of the actual consumption."

"The study also has been designed to predict demand for the different major agricultural regions of the country. In its present stage of development the equation will not

Key To Pictures

1. Dudley George, Richmond Guano Co., Richmond, Va., and Edwin Pate, Dixie Guano Co., Laurinburg, N. C.
2. K. D. Jacob, USDA, Beltsville, and Leroy Donald, Monsanto Chemical Co., St. Louis.
3. John Mooar, Sturtevant Mill Co., Atlanta; Tom Bridgers, Farmers Cotton Oil & Fertilizer Co., Wilson, N. C.
4. Mr. & Mrs. Joe C. Sharp, Spencer Chemical Co., Kansas City.
5. W. L. Garman, Best Fertilizer Co., Lathrop, Calif.; Werner L. Nelson, American Potash Institute, Lafayette, Ind.; and T. F. Bridgers, Farmers Cotton Oil Co., Wilson, N. C.
6. L. B. Hein, Olin Mathieson Chemical Co., Joliet, Ill.; G. L. Bridger, W. R. Grace & Co., Clarksville, Md.
7. Mr. & Mrs. Ralph Boynton, U. S. Potash Co. Div., New York; W. E. Shelburne, Armour Agricultural Chemical Co., Atlanta.
8. Delbert Rucker, NPFI, Washington; Joe Stough, U. S. Potash Co. Div., Columbus, O., and W. D. Barton, Tennessee Corp., East Point, Ga.
9. Frank M. Feffer, Arizona Fertilizers, Phoenix, and James E. Totman, Summers Fertilizer Co., Baltimore.
10. Mr. & Mrs. E. T. Spidle, Capital Fertilizer Co., Montgomery; Mr. & Mrs. W. D. Barton, Tennessee Corp., East Point, Ga.
11. Walter Harding and Sam Shelby, Federal Chemical Co., Louisville; R. R. Burns, Tennessee Copper Co., Copperhill, Tenn.; John R. Sargent, Federal Chemical Co., Louisville; and J. B. Garr, American Cyanamid Co., New York.
12. Steele Wright, Texas Farm Products Co., Nacogdoches, Texas, and Howard A. Parker, Parker Fertilizer Co., Sylacauga, Ala.
13. W. F. Price and T. L. Adcock, Swift & Co., Chicago.
14. Mr. & Mrs. Jim Basinger, U. S. Pipe & Foundry Co., Birmingham.
15. John Sargent, Federal Chemical Co., Louisville, and Charlie Keefer, St. Regis Paper Co., Louisville.
16. Harold Krueger, Stedman Foundry & Machine Co., Aurora, Ind., and Curtis Cox, Virginia-Carolina Chemical Corp., Richmond.
17. George H. Serviss, Coop. G.L.F. Soil Building Service, Ithaca, N.Y.; Loy Everett, Commercial Solvents Corp., New York.
18. Gene Cartledge, Union Bag-Camo Paper Corp., Norfolk; Raymond Cartledge, Cartledge Fertilizer Div., Wilson & Toomer, Cottondale, Fla.
19. John Perryman, R. D. Cole Mfg. Co., Newnan, Ga., and Fred Broadway, International Minerals & Chemical Corp., Atlanta.
20. Mr. & Mrs. A. J. Dirksen, American Potash & Chemical Corp., New York; George Belicka, Jr., American Process Co., Lebanon, Pa.
21. Mr. & Mrs. Jack Rutland, Western Carolina Phosphate Co., Waynesville, N. C.
22. Allen Burson, Cotton Producers Assn., Atlanta, and Bob Mell, Potash Co. of America, Washington.
23. Grant Kilbourne, J. R. Simplot Co., Pocatello, Idaho, and M. C. Wheeler, Commercial Solvents Corp., New York.
24. Jim Turner, U. S. Borax & Chemical Corp., Knoxville, Tenn.; and D. H. Banks, Banks Fertilizer Co., St. Matthews, S. C.

Speed handling, reduce pile set with Du Pont URAMON® Ammonia Liquors

You can keep production fast-moving and your fertilizer free-flowing with the added conditioning benefits of Du Pont "Uramon" Ammonia Liquors.

UAL helps to prevent the cementing, pile-setting action that often results from some other nitrogen formulations. As mixtures ammoniated with UAL cool, residual moisture combines with the compounds formed—leaving a dry mix remarkably free of excessive caking, segregation and dusting. Result—your UAL goods suffer less pile set, seldom require blasting and can be moved readily by the payloader.

In addition, Du Pont "Uramon" Ammonia Liquors are non-corrosive, can be used in ordinary steel equipment. Secondary set and caking in the bags are also minimized because the urea from UAL is non-reactive with other fertilizer ingredients. And UAL mixtures are highly drillable.

After application, the extra fertilizing benefits of UAL begin. UAL provides nitrogen in both the urea and ammonium form—nitrogen that becomes available at a rate closely paralleling plant requirements. Nitrogen from Du Pont UAL is also leach-resistant; remains in the root zone long after other forms have been exhausted.

Du Pont UAL is available in five forms, including UAL-37 for even more gradual nitrogen release, and UAL-S with the added conditioning effects of ammonium sulfate. For information on which type is best suited to your needs, write Du Pont.

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necessarily reflect all the factors that influence fertilizer consumption, particularly in an unusual year." He indicated, however that "with a proper understanding of the limitations of the method developed, it can be helpful to the fertilizer industry in planning its operations. The study is being continued in an effort to further refine the method."

Dr. King said that relatively simple equations have provided good estimates of fertilizer use at the national and regional levels. While acknowledging the problem of securing sufficient basic data, he stated an opinion that reliable results can be produced with the data available.

In commenting on the study, M. S. Williams, chief agricultural economist for NPFI, pointed out that "the Institute is requesting assistance from market research personnel of member companies in an effort to further refine the technique."

At the afternoon session W. Raoul Alstetter, NPFI vice president, moderated a panel on "Fertilization in the Future."

L. D. Baver, experiment station director for Hawaiian Sugar Planters Association, told the group the production of sugar per acre is higher in Hawaii than any other sugar-producing area. This is due to development of new varieties and to intelligent use of fertilizer, he continued; illustrating how plant and soil compositions are related to fertilizer responses. Showing how leaf and stalk analysis are correlated with the age of the plant in arriving at its fertilizer requirements, Dr. Baver stated that average fertilizer applications of 850 pounds of actual plant food per acre are bringing yields of more than five tons of sugar per acre per year (10 tons per crop).

"Converting Low Value Crops Into High Value Crops" was the topic of J. Fielding Reed, southern manager for American Potash Institute. While the greater part of the cropland in the U. S. is devoted to the so-called 'low value' crops, he related, these can often be turned into average value or high value crops by reducing unit cost through proper fertilization.

Using film slides, Dr. Reed told how wheat and cotton crops as well as hay and pasture could be transformed into high-yielding, low-unit-cost crops. Citing actual figures from many sections of the nation, he showed how our needs could be met with considerably less acreage in several major crops, and at a considerably higher profit to the farmer.

R. J. Hildreth, research coordinator for west Texas for the Texas Agricultural Experiment Station, discussed "Minimizing Weather Risks with Fertilizer." He told how the 'weather barrier' looms much larger in the farmers' eyes than the facts justify. Many farmers, fearing unfavorable weather conditions for a crop, have "substantially underestimated their chances of fertilizer profit, even if we ignore potential fertilizer carry-over from low-moisture years."

Dr. Hildreth predicted that once we know **(a)** the weather probability, **(b)** most profitable rates of fertilizer use at various moisture levels, and **(c)** how much moisture there is available at the beginning of the season, then calculations

at NPFI

1. R. E. McAllister, Consolidated Mining & Smelting Co. of Canada, Montreal, and K. D. Jacob, USDA, Beltsville, Md.
2. Mr. & Mrs. Joe Culpepper and Mr. & Mrs. B. M. Kern, Spencer Chemical Co., Kansas City.
3. John Foy, Ashcraft-Wilkinson Co., Atlanta, and Mr. & Mrs. Bruce Osborn, Southern Cotton Oil Co., New Orleans.
4. Warren Huff, Ashcraft-Wilkinson Co., Columbus, O.; W. F. Farley and W. E. Farley, Jr., Smith Agricultural Chemical Co., Columbus, O.
5. A. M. Horehled, Sinclair Petrochemicals, Chicago, and John Mahan, USDA, Washington.
6. V. C. Irvine, Shell Chemical Corp., San Francisco; Howard J. Grady and Malcolm McVickar, California Spray Chemical Co., Richmond, Calif.
7. Mr. & Mrs. George Barley, Diamond R Fertilizer Co., Winter Garden, Fla., and Graham Campbell, Independent Mfg. Co., Philadelphia.
8. R. Gadonneix, Societe Commerciale des Potasses d' Alsace, Paris France; Mr. & Mrs. Fernando Olascoaga, Potassas Espanolas, S.A., New York; James E. Totman, Summers Fertilizer Co., Baltimore.
9. Mrs. K. B. Stuart and Mrs. Frank Jasper, Denver; and Mrs. Rex Morgan, Corning, Ark.

Arcadian® News

Volume 4 | For Manufacturers of Mixed Fertilizers | Number 7

CASH IN ON THE TREND TO N

Put More N in N-P-K

Since the 1945-46 fertilizer year, consumption of the three major plant foods has risen rapidly. Use of nitrogen has gone up fastest of all; however, this spectacular growth was mostly in straight nitrogen materials. Nitrogen marketed in mixed goods showed only a gradual increase, as compared to big increases for P_2O_5 and K_2O in mixed goods. Far more nitrogen is sold as straight materials than in mixed fertilizers.

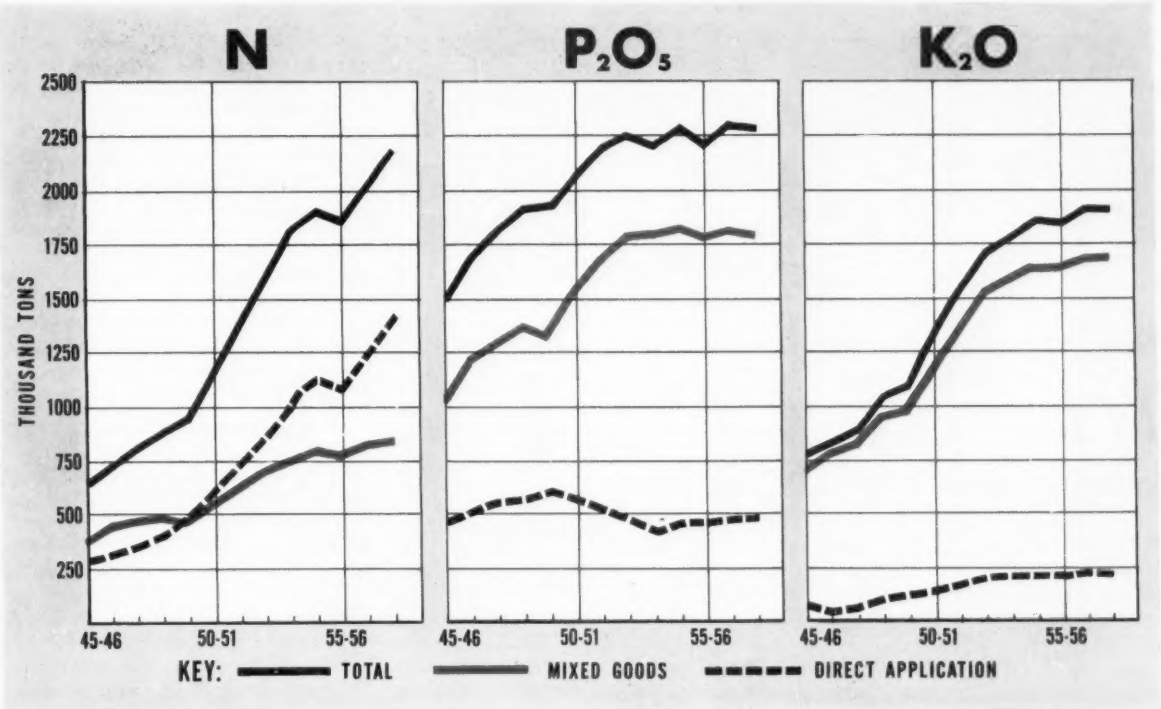
Yet it is practical, efficient and economical to supply most of the nitrogen needs of most crops with mixed fertilizers. This situation represents a tremendous opportunity for fertilizer manufacturers to cash in on the trend to N, by putting more nitrogen in mixed fertilizers.

Even with the big increase in nitrogen consumption, few farmers now use enough nitrogen to get best returns from the other plant foods in their soil.

Farmer acceptance of high-analysis,

(Continued on following page)

U. S. CONSUMPTION OF MAJOR PLANT FOODS



(Continued from preceding page)

high-nitrogen mixed fertilizers has been excellent in all areas where marketed. More and more fertilizer manufacturers are climbing on the high-nitrogen band wagon. 2-1-1 and 3-2-2 grades are agronomically sound for many crops and are moving up in popularity.

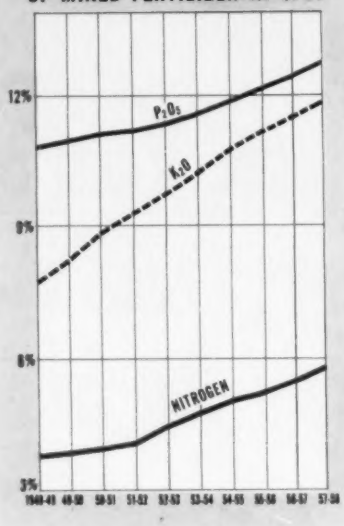
Big Consumers of Nitrogen

Most of the leading fertilizer-consuming crops need more nitrogen than any other plant food. Corn, wheat and cotton require more than twice as much nitrogen as phosphoric acid, and far more nitrogen than potash. Modern grazing and hay crops are big users of nitrogen. Animal products produced on farm-grown feeds remove from the soil much larger amounts of nitrogen than of phosphoric acid or potash.

PLANT FOOD REMOVED BY CATTLE AND HOGS PER TON OF PRODUCT SOLD

	N lbs.	P_2O_5 lbs.	K_2O lbs.
Cattle	55	32	4
Hogs	91	43	4
Milk	12	4	3

AVERAGE PLANT FOOD CONTENT OF MIXED FERTILIZER IN U. S.



The practice of growing legumes to provide nitrogen is fast declining because the high cost of land makes it uneconomical in most areas. Livestock manure, another traditional source of nitrogen, is not available in quantity, and the cost of loading, hauling and spreading manure is extremely high per unit of plant food. Livestock and dairy farms are a growing market for high-nitrogen fertilizers.

PLANT FOOD CONTENT OF CROPS

Crop	Yield	Part of Crop	N lbs.	P_2O_5 lbs.	K_2O lbs.	Total
COTTON	750 lbs.	lint				
	1,250 lbs.	seed	60	30	20	110
	2,000 lbs.	burrs, leaves and stalks	45	15	45	105
	Total		105	45	65	215
CORN	100 bu.	grain	90	35	25	150
	3 tons	stover	70	25	95	190
	Total		160	60	120	340
WHEAT	40 bu.	grain	50	25	15	90
	1.5 tons	straw	20	5	35	60
	Total		70	30	50	150
OATS	80 bu.	grain	50	20	15	85
	2.0 tons	straw	25	15	80	120
	Total		75	35	95	205

It will pay you to start now to get more of the nitrogen market and more of the total fertilizer market by putting more nitrogen in mixed fertilizers. You get more of the farmer's fertilizer dollar when you supply his nitrogen needs with mixed fertilizer than when you sell him low-nitrogen mixtures that must be supplemented with extra applications of nitrogen.

New Techniques

Today you are in a better position than ever before to make and sell high-nitrogen fertilizers at a profit. You have the market and the methods. The development of new ammoniation techniques enables you to greatly increase the nitrogen content of mixed fertilizers, with all the nitrogen derived from low-cost ARCADIAN® Nitrogen Solutions.

When you balance your fertilizer with adequate nitrogen to meet crop requirements, you also help to insure the best possible return from the phosphorus and potash in your fertilizer. Research has proved that sufficient available nitrogen increases a plant's efficient use of phosphorus and potash.

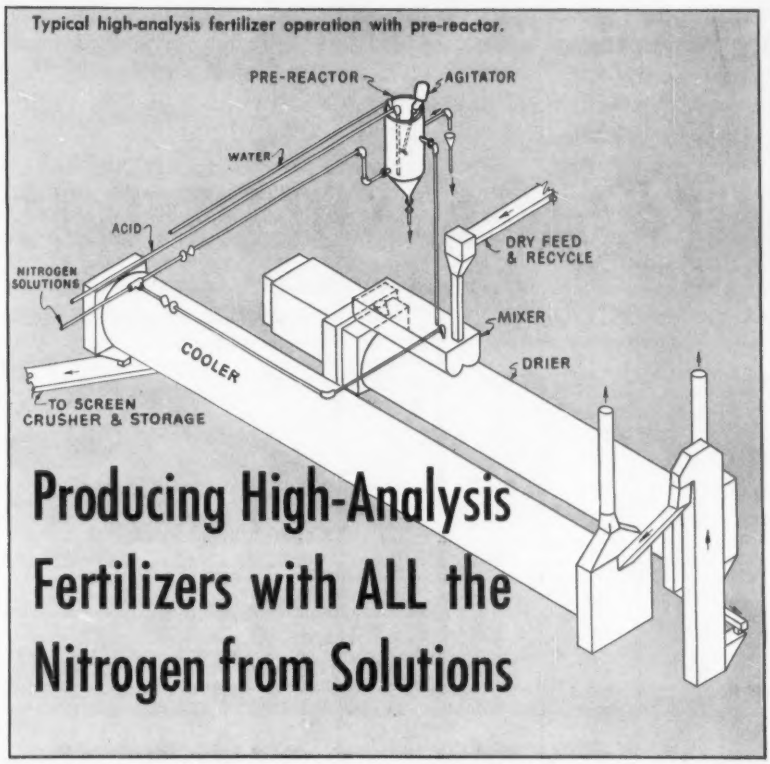
Bigger Dollar Volume

By producing high-analysis, high-nitrogen mixed fertilizers, you can put a bigger dollar volume of tonnage through your plant. You can also save money in storage and shipping costs per unit of plant food. These costs are becoming more important, with increasing freight rates and the necessity to warehouse more tonnage in late seasons.

With high-nitrogen fertilizers, you increase the farmer's profit, your profit and your dealer's profit. Your dealer can make better use of his storage and trucking facilities. He has less storage cost per dollar of inventory and he hauls a higher value pay load. Most important of all, he can supply his farmer customer with his complete plant food requirements in a one-sale, one-package deal. This builds exclusive customers and minimizes the danger of losing business to a competitor.

Call Nitrogen Division

It will pay you to start now to make and sell more high-nitrogen mixed fertilizers. Get all the facts on the new and different production techniques that enable you to produce high-nitrogen mixed fertilizers with all the nitrogen derived from low-cost ARCADIAN Nitrogen Solutions. Contact: Nitrogen Division, Allied Chemical Corporation, 40 Rector Street, New York 6, N. Y.



Producing High-Analysis Fertilizers with ALL the Nitrogen from Solutions

NEW PRE-REACTOR PUTS MORE N IN N-P-K

Now it's easier than ever before for you to supply the growing demand for high-analysis, high-nitrogen mixed goods *at a profit!* By utilizing the new pre-reactor process, you can produce such grades as 16-8-8, 16-4-8, 15-10-10, 12-12-12, and 14-0-14, with *all* the nitrogen derived at low cost from ARCADIAN® Nitrogen Solutions.

Before the development of the pre-reactor, getting maximum use out of nitrogen solutions was limited by the amount of acid that could be added to the mix without developing excessive heat in the liquid phase. Conventional ammoniator-mixers are limited in their capacity to handle this operation with safety and precision.

Keeps Acid Out of Mix

The pre-reactor method keeps all acid out of the mix and confines it to the pre-reactor along with the nitrogen solution. Here, the acid neutralizes the free ammonia in the nitrogen solution. The heat generated by this reaction is dissipated through evaporation of water by the pre-reactor. This avoids the old problem of excessive heat in the liquid phase.

In fact, the pre-reactor provides better control of the heat and water content of the mix. By adding water to the pre-reactor at an easily determined rate, a constant temperature is maintained and a slurry of uniform nitrogen and water content is fed to the mixer. It's easy to efficiently neutralize all the ammonia in excess of that needed to ammoniate superphosphate.

How the Pre-reactor Works

Specified amounts of acid and nitrogen solutions flow continuously into the pre-reactor through separate distributors. The liquid mass undergoes violent churning by agitator propellers. Water is added to cool the mass and keep it in a liquid state. It is this liquid condition that prevents much of the uncertainty, risk and loss encountered with conventional ammoniator-mixers where the mass of ingredients is relatively dry.

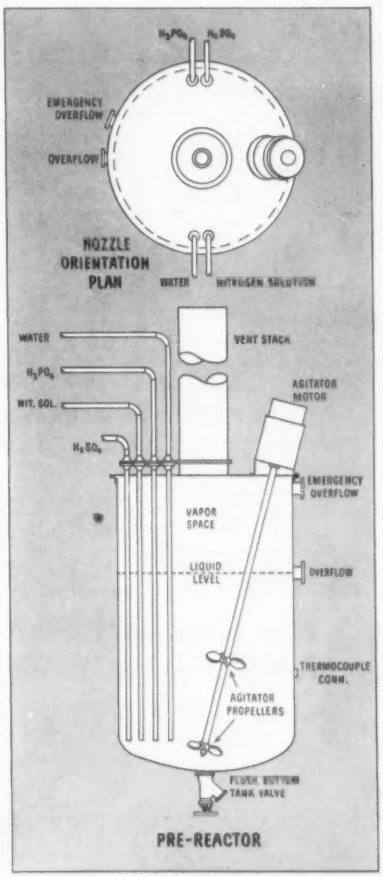
When the reaction is completed in the pre-reactor, the effluent flows by gravity into the mixer to combine with dry and re-cycle materials. This effluent can be delivered into the normal granulating system at a temperature, physical condition and moisture content that favors granulation and holds re-cycle to a minimum. By properly using a pre-reactor in tandem with an ammoniator-mixer equipped with a double-shafted pug mill, quality granular fertilizers are produced with a recovery of 97 to 98% of nitrogen input.

Get Full Details

If you are interested in producing high-analysis fertilizers in 2-1-1, 3-2-2, 1-1-1 and 1-0-1 ratios, with all the nitrogen from solutions, it will pay you to investigate the new pre-reactor technique. You'll find that you get big benefits in safety, precision and control. And you increase your profits by obtaining *all* your nitrogen from low-cost ARCADIAN Nitrogen Solutions.

There is nothing complicated about incorporating a pre-reactor in a normal high-analysis manufacturing operation. The same standard equipment is used . . . nothing is eliminated. You'll *like* your results in volume, quality and extra profits!

For complete details on how to add a pre-reactor to your present set-up, contact: Nitrogen Division, Allied Chemical Corporation, 40 Rector Street, New York 6, N.Y. Telephone HAnover 2-7300.



HERE'S THE BIG LINE OF Arcadian® NITROGEN SOLUTIONS

When you purchase your nitrogen requirements from Nitrogen Division, Allied Chemical, you have many different nitrogen solutions from which to select those best suited to your ammoniation methods and equipment. You are served by America's leading producer of the most complete line of nitrogen products on the market. You get formulation assistance and technical help on manufacturing problems from the Nitrogen Division technical service staff. You benefit from millions of tons of nitrogen experience and the enterprising research that originated and developed nitrogen solutions.

	CHEMICAL COMPOSITION %						PHYSICAL PROPERTIES		
	Total Nitrogen	Anhydrous Ammonia	Ammonium Nitrate	Urea	Water	Neutralizing Ammonia Per Unit of Total N (lbs.)	Approx. Sp. Grav. at 60°F	Approx. Vap. Press. at 104°F per Sq. In. Gauge	Approx. Temp. at Which Salt Begins to Crystallize °F
NITRANA®									
2	41.0	22.2	65.0	—	12.8	10.8	1.137	10	21
2M	44.0	23.8	69.8	—	6.4	10.8	1.147	18	15
3	41.0	26.3	55.5	—	18.2	12.8	1.079	17	-25
3M	44.0	28.0	60.0	—	12.0	12.7	1.083	25	-36
3MC	47.0	29.7	64.5	—	5.8	12.6	1.089	34	-30
4	37.0	16.6	66.8	—	16.6	8.9	1.184	1	56
4M	41.0	19.0	72.5	—	8.5	9.2	1.194	7	61
6	49.0	34.0	60.0	—	6.0	13.9	1.050	48	-52
7	45.0	25.3	69.2	—	5.5	11.2	1.134	22	1
URANA®									
6C	43.0	20.0	68.0	6.0	6.0	9.3	1.180	12	39
6M	44.0	22.0	66.0	6.0	6.0	10.0	1.158	17	14
10	44.4	24.5	56.0	10.0	9.5	11.0	1.114	22	-15
11	41.0	19.0	58.0	11.0	12.0	9.2	1.162	10	7
12	44.4	26.0	50.0	12.0	12.0	11.7	1.087	25	- 7
13	49.0	33.0	45.1	13.0	8.9	13.5	1.033	51	-17
15	44.0	28.0	40.0	15.0	17.0	12.7	1.052	29	1
U-A-S®									
A	45.4	36.8	—	32.5	30.7	16.2	0.932	57	16
B	45.3	30.6	—	43.1	26.3	13.5	0.978	48	46
Anhydrous Ammonia	82.2	99.9	—	—	—	24.3	0.618	211	-108

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San Francisco 4, Cal., 235 Montgomery St. Yukon 2-6840

should give a fairly refined estimate of the odds in favor of profits from various levels of fertilizer use.

Mr. Bennett again presided at the Tuesday business session.

"Net farm income in 1959 will be only slightly less favorable than in 1958," was the statement of Earl F. Crouse, president of Farm Business Council, who explained that "total farm income will be close to the favorable levels of the past year, but costs will be higher." No farm recession is in sight for 1960, he continued, but livestock and poultry producers will be 'hurting' in relation to crop producers.

Wherever possible farmers are buying their labor on a piecework basis, and the fertilizer manufacturers and dealers who best succeed in reducing the on-farm labor costs of using fertilizer have an inside track to the market, Mr. Crouse advised, as the modern farmer is forced to consider fertilizer costs in terms of plant food in the ground . . . including the material and the labor of application.

Jamie L. Whitten, final speaker on the program, is a Democratic representative from Mississippi and chairman of the House Appropriations Subcommittee for Agriculture. Speaking on "What's Needed in the Farm Program," he stated his conviction that we must amend the present law providing for acreage limitations, correct faulty administration, and provide the kind of price protection that will permit the farmer to get his fair share of the national income in the market place.

When farmers don't get this fair share at the market place, he continued, they must either get it from the treasury or take it out of the land, depleting our most important natural resource. A means must be found to stop risking 50 to 100% of the value of the land each time a crop is planted.

"But with buyer resistance to increasing prices at the consumer end, the net result is that the farmer is being forced to absorb most of the increasing costs all along the line" for the middleman, processor and retailer whose costs are also on the rise.

"Neither can we blame the farm suppliers, like the fertilizer industry. They, too, must make a profit to stay in business. And improved efficiency can, at best, absorb only a part of their increasing costs. The remainder must be passed along to

MURIATE OF POTASH for the PLANT FOOD INDUSTRY

THIS symbol stands for high-grade uniform, coarse and granular Muriate of Potash (60% K_2O minimum). Southwest Potash Corporation provides a dependable supply of HIGH-K* Muriate for the plant food industry.

*Trade Mark

Southwest Potash Corporation

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their customers (the farmers) in higher prices."

Rep. Whitten drew some definite conclusions as to what remedies Congress should effect, but concluded that "Farm income should come from the market place. In the long run, it must. Don't be misled by those who want no part of the farmer's share of the consumer dollar and force him to look annually to the treasury for a remedy."

At the banquet which climaxed the convention, Russell Coleman, NPFI executive vice president, made the annual Soil Builders Awards for Editors. From a field of 29 entries, awards for "superior journalistic contributions toward the building of the soils of our nation" went to: Eugene Butler, editor-in-chief of 'The Progressive Farmer' at Dallas, Texas, for magazines with more than 300,000 circulation, and to Bob Christianson, editor of 'The Arkansas Farmer,' Little Rock, for magazines of less than 300,000 circulation.

1. Mrs. Ed Spidle, Montgomery, Ala.; Mrs. W. D. Barton, East Point, Ga.; Mrs. George K. Walton and Mr. Lloren E. McQuerter, Lockland, Ohio; and Mrs. D. H. Banks, St. Matthews, S. C.

2. R. B. Bennett, Union Bag-Camp Paper Corp., New York; Howard Morgan and Howard C. Fisher, Diamond Fertilizer Co., Sandusky, O.; S. K. Bradley, and W. F. Jacobi, Union Bag-Camp Paper Corp., New York.

3. A family gathering of the Wrights from Texas Farm Products Co., Nacogdoches, Texas —standing: Joe Wright, SteeleWright, Jr., Sam Bishop and SteeleWright, Sr.; Seated: Charlie Bishop, Mrs. Sam Bishop, Mrs. Hugh Adams, Mrs. SteeleWright, Jr.

4. A DuPont crowd: Jack Ullman and Frank Keenen, Wilmington; Gordon Bethards, Chicago; Mr. & Mrs. Frances Jornlin, Wilmington; Phil Turner, Toledo; S. F. Taylor, Philadelphia; J. W. Lewis and M. F. Gribbins, Wilmington.

5. Mr. & Mrs. John Fletcher, of U. S. Potash Co. Div; Mr. & Mrs. Larry Byck and Mr. & Mrs. Bob Magness of U. S. Industrial Chemicals Div., all from New York.

6. Mrs. L. E. McQuerter, Lockland, Ohio; Mrs. D. H. Banks, Sr., and Mrs. D. H. Banks, Jr., St. Matthews, S. C.; Mrs. Joe Wright, Nacogdoches, Texas; (standing) Mrs. Tom Ware and Mrs. Louis Ware, Skokie, Ill.

Du Pont Premieres Movie On Urea Fertilization

"Greener Pastures," a Du Pont-sponsored educational movie on the value of urea for supplemental nitrogen applications to increase agricultural yields and efficiency, was given a premiere showing for the press June 15 at the annual meeting of National Plant Food Institute. F. M. Jornlin, sales manager for Du Pont's nitrogen products section, was principal host at the luncheon showing.

Filmed mainly in the Mid-Atlantic states and Midwest, the movie (16 mm., color, sound, 12 minutes) compares old farming methods with those of the modern farmer who employs scientific soil-testing and fertilization. Benefits of pasture-building to dairymen and cattlemen are cited in graphic illustrations of increased yields resulting from supplemental nitrogen applications.

Use of urea fertilizer in aerial spreading, irrigation, and in foliage sprays is also shown.

Du Pont's "Greener Pastures" movie may be obtained on loan from: W. F. Morris, Industrial and Biochemicals Department, Du Pont Company, Fairfax, Wilmington 3, Del.

IMC Shows Movie 'Out of the Earth'

Twice during the annual meeting of National Plant Food Institute at White Sulphur Springs last month, International Minerals & Chemical Corp. showed an interesting film, "Out of the Earth."

The movie showed the broad scope of IMC's operations in mining and processing agricultural and industrial materials, and extended the view to the end-use of each product. As the company's principal interests lie in the fertilizer industry, much of the film was devoted to recovery and refining of its phosphate and potash products for use by fertilizer manufacturers.

Forest Feeding Clearing House

The establishment of a clearing house of information on nutrition and fertilization of southern forests by the National Plant Food Institute, in cooperation with the National Joint Committee on Fertilizer Application, was recently announced by Dr. Laurence C. Walker, Southeastern Regional Forester for the Institute.

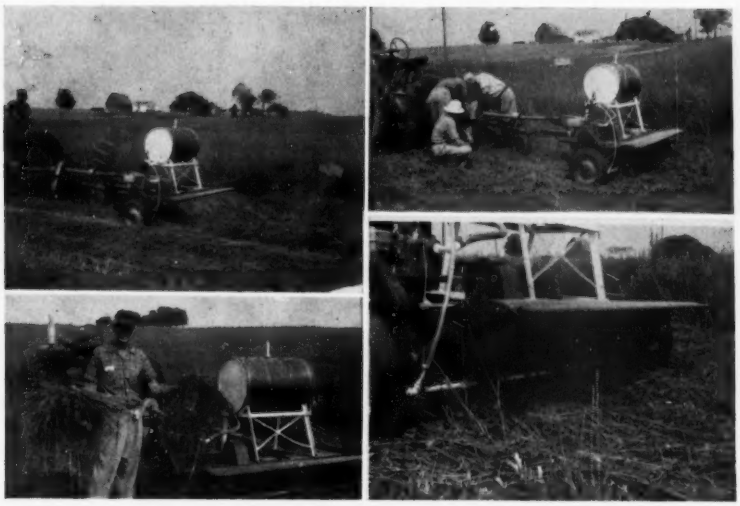
This information center will receive details of experiments for subsequent distribution to interested persons. To receive these periodic releases, those on the mailing list are obligated to submit information relative to their own work on nutrition and fertilization.

Dr. Walker is presently soliciting participants and requesting brief summaries of research underway, including personnel, organization, location, and experimental description. Tentative conclusions are not desirable; but final results are. The first mailing to cooperators is expected by mid-summer.

Persons desiring to be included on the mailing list should address the Southeastern Regional Forester, National Plant Food Institute, 190 Hardin Drive, Athens, Georgia.

Should response to this southwide program be favorable, the Institute and the NJCFA plan to expand the scope to include all of the United States and Canada.

Dr. Walker points out that this venture is cooperative: both the Southeatern Regional Forest Fertilization Task Force of the NPFI and the Forestry Sub-committee of the NJCFA are comprised of research and practicing foresters representing industry, government, and education.



(Photos courtesy of Ben Shively, assistant Delaware County agent)

Upper left: Dan Wright of Delaware County, Indiana is shown on the tractor as he mows, conditions and top dresses hay, all in one operation, at the first cutting.

Upper right: C. J. Stienbrunner, product improvement director for New Idea Farm Equipment, shows farmer Dan Wright the adjustments on the mower and conditioner drive. Ben Titus, division manager of U. S. Liquid Fertilizer Co., Warsaw, Ind. is in the white helmet.

Lower left: Les Hill, Purdue extension agricultural engineer, illustrates that the conditioner is making the hay dryer. Uncrushed hay is on the left, conditioned hay on the right.

Lower right: The 'new' concept of the equipment is shown here; pipe boom with three broadjet nozzles is supported at both ends.

Simultaneous Mowing, Conditioning and Top Dressing

Experiments in the simultaneous mowing, conditioning and top-dressing of hay with complete liquid fertilizer have been under way in Indiana recently. Extension Agricultural Engineer Les Hill of Purdue University has been directing the project at the Wright farm in Delaware County. Assisting in the work were Ben Titus, division manager of U. S. Liquid Fertilizer Corp., Warsaw, Ind. and C. J. Stienbrunner, product improvement director for New Idea Farm Equipment, as well as farmer Dan Wright.

Heart of the project was to determine what problems might be involved in applying liquid fertilizers at the same operation with the mowing and conditioning. No special difficulties arose, and the experiment was termed successful.

Ben Titus installed the fertilizer equipment on a New Idea conditioner brought up from Texas for the trials. Fertilizer was sprayed on the alfalfa stubble through three #10, ⅛-inch broadjet nozzles on a pipe boom covering a 100-inch swath. The pipe boom was mounted below the arc plate and behind the roller on the conditioner, so that the crushed hay falls back down on the stubble immediately after the liquid fertilizer is sprayed on.

Application was at the rate of 300 lb./acre of 4-11-11 to boost yield tonnage of the second cutting, and in anticipation that the phosphate and potash would help to maintain the stand of alfalfa for several years.

In three trial runs between June 5 and June 10, the equipment performed satisfactorily; each cutting, raked and baled the next day, was found to be in excellent condition.

Work on the project is continuing, with the expectation of developing even more flexible application equipment to be used in conjunction with the conditioning machinery.

Bert Tucker Says Sponsors For Sales Book Needed

Noting the intense interest in National Plant Food Institute's Fertilizer Salesman's Handbook on the part of professional agricultural counselors who have seen the volume, Sohio Chemical Company has undertaken to distribute copies of the manual to county agents, soil conservation district supervisors and vocational agriculture teachers in Ohio.

Due to the unlimited task and heavy expense, Sohio has not attempted to make this sort of complimentary distribution of the edition outside the state of Ohio, but hopes other fertilizer materials producers and manufacturers will take this opportunity to further the interests of the entire industry in their immediate areas.

H. H. Tucker, Sohio's agricultural service director, expressed a belief that "other companies in other areas might select their own area and do likewise, so that this publication would have general distribution" and would "do much both directly and indirectly to promote fertilizer sales."

Any firms interested in making a distribution of this sort can obtain prices on the Fertilizer Salesman's Handbook from National Plant Food Institute, 1700 K St., N.W., Washington 6, D.C.

NC-Va. Institute Aids Growers

With a very local slant on their material, the Plant Food Institute of North Carolina and Virginia, Inc. is doing a job of serving the tobacco, cotton, sweet potato and other agricultural interests of their area. We have recently received a bulletin from them which incorporates a number of success stories, with details of how the success was achieved.

Attached to this bulletin was another, from the Flue Cured Tobacco group, discussing the very controversial question of maleic hydrazide. Farmer pressure prevented the N. C. legislature from banning this labor saver, which is for sucker control. But the warning is out that the cigarette people may refuse to buy, as they have already refused to pay top prices, for tobacco so treated.

It seems to be a mighty hot question.

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ON THE UP GRADE

With the economy of the US generally outstripping the most optimistic forecasts of the economists, how is the farm scene doing specifically, how is fertilizer doing? And whence the growth? Here are a few examples:

1958-59 Season, while the returns are not all in as we write this, looks to be a year of 24,000,000 tons. This is good, but the truth is even better. As of 1950 the plant food content of fertilizer averaged 23% . . . it is now running somewhat better than 30% active nutrients.

Consumers Coop figures for April, and they represent a wide mid-West situation, were 54% up from the previous April. These were sales to member coops. A factor in the increase is the demand for 32% N nonpressure liquid, according to their fertilizer division director, A. H. Stephenson.

California used more fertilizer during the first 3 month period of 1959 than during any previous first quarter, according to CFA. They credit increased awareness by the farmer of the need for plant food.

Florida is listed as third in the nation in the consumption of fertilizer per acre. Professional farmers, amateurs and home owners all join in making up this total. But Polk County is naturally enough the heaviest user, with Lake, Orange, Dade, Palm Beach and Hillsborough counties running close behind. Together they add up to 1,299,000 tons of mixed fertilizer, of which some 82% is Florida-made, plus 625,000 tons of unmixed plant food, also locally produced.

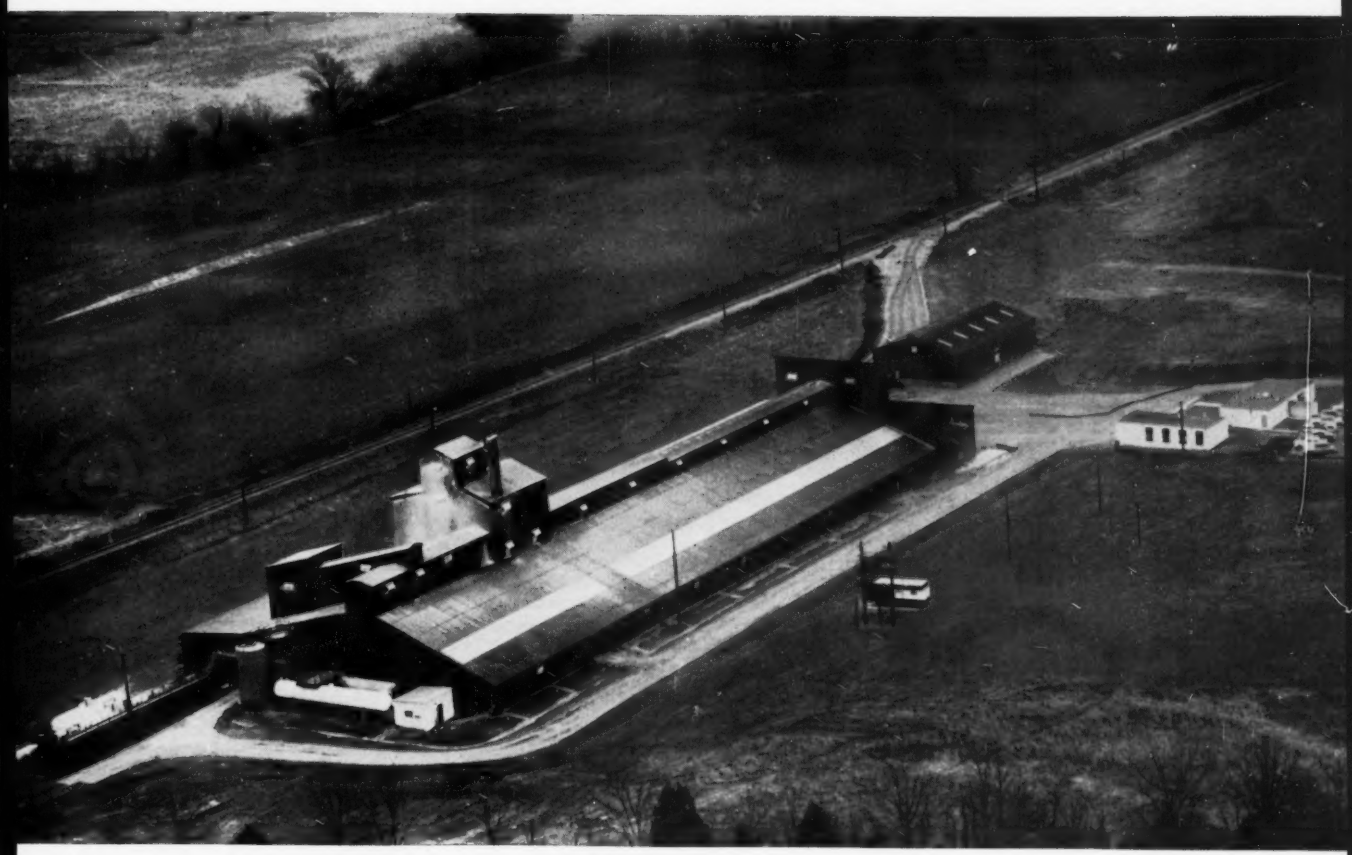
Georgia's soil fertility program, which has had acceptance surprising to the agronomists in charge, has meant a saving of millions, because Georgians have stepped up analysis on the average, and the program has lowered unit costs of production. Dr. R. L. Wehunt points out a three year gain of nearly 50% in use of N which may be credited largely to the program.

Minnesota farmers this season used 14% more fertilizer than they did the year before - almost half a million tons. In terms of plant food that is only part of the story, because again here are farmers using higher analysis fertilizer. But, says W. P. Martin, head of the University soils department, much state land is still going fertilizer hungry.

Ohio's Guernsey County has been using more lime and more fertilizer. The extension service men there credit this to the intensified soil testing program - in which NPFI aided in many ways - as we have previously reported.

Tennessee expects an all-time record fertilizer consumption of more than 600,000 tons, according to Extension Agronomist W. D. Bishop, and lime usage will be near 1½ million tons. But it's not enough, says Dr. Bishop; while fertilizer use will be 20-30% above 1957-58 levels, applications are less than half the recommended amount. And it would require 3 million tons of lime annually for 15 years to correct soil pH in the state, then 2 million tons a year to maintain it.

The relation of soil testing to fertilizer responses obtained on Washington Outlying Test Plots is discussed by Darrell Turner (left), Extension Soils Specialist; Trevor Steele, American Potash and Chemical Co., LeVern Freimann, Whatcom County Extension Agent, and Dale Massie, Cominco Products, Inc. The Outlying Testing Plots are supported in part by a National Plant Food Institute grant.



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CHANGES

White

Moyers

Gopp

Stark

IMC

International Minerals & Chemical Corporation has announced a major realignment of its principal product divisions.

The change, effective July 1, consolidates three top divisions into a streamlined Agricultural Chemicals Division in which fertilizer materials salesmen will sell IMC's full line. Previously each materials division had a separate sales force.

The new Agricultural Chemicals organization combines the Potash Division with the Phosphate Division which was set up last fall.

The reorganization plan establishes new responsibilities for two senior IMC vice presidents.

Nelson C. White, vice president of the Potash Division, becomes vice president in charge of long-range planning for agricultural chemicals. George W. Moyers, vice president of the Phosphate Division, becomes vice president and special assistant to the president on agricultural chemicals assignments. He will continue to direct phosphate export sales.

Two new vice presidents in the Agricultural Chemicals Division are Leonard W. Gopp in charge of sales and David J. Stark, operations. Mr. Gopp was formerly general sales manager for IMC phosphate chemicals and Mr. Stark joined IMC from Escambia Chemical Corporation, where he was vice president and production manager.

Three sales departments in the Agricultural Chemicals Division will report to Mr. Gopp. They are the Feed Ingredients Department, headed by John K. Westberg; the Direct Application Rock Phosphate Department, directed by Joseph L. Mealy; and the Basic Materials Department, which consolidates sales of all plant food materials, under E. C. Horne. Mr. Horne came to IMC from Bradley & Baker, where he was general manager in charge of fertilizer sales.

The reorganization puts emphasis on improved technical services and other special customer services by setting up two new departments to handle these functions.

Horne, with R. E. Linderman as product manager for phosphate and S. B. McCoy as product manager for potash, will direct sales operations through regional managers in New York, Shreveport, La., Indianapolis, Minneapolis, and Atlanta. Indianapolis and Minneapolis are new offices established to cover areas previously handled from IMC headquarters in Skokie, Ill., suburban Chicago. Twelve district sales managers will report to the five regional offices.

Mr. Ware said that better use of the same number of salesmen and new emphasis on technical and other services will bring direct benefits to IMC customers.

"One salesman, selling the full IMC line, can get a better understanding of the customer's problems and requirements, and with the help of specialists he can provide better service in all areas," Mr. Ware said.

Field sales services for direct application rock phosphate and feed ingredient departments are unchanged.

American-Marietta Company

Marietta Concrete Corporation has announced the merger of its business and operations with American-Marietta Company, one of the nation's larger producers of construction materials.

In Chicago, Robert E. Pflaumer, president of American-Marietta, said that Marietta Concrete would be operated as a part of the parent company's Concrete Products Division. F. Leonard Christy, president of Marietta Concrete, will continue as the chief operating officer, R. Neil Christy will maintain responsibility for engineering and production and the entire organization will remain intact.

Smith-Douglass

Effective August 1, the Smith-Douglass Company has announced that separate identities of its operating divisions will be discontinued and the Smith-Douglass corporate name will be used for all manufacturing divisions.

The product name, Smirow tankage, will be retained. The Smith-Rowland manufacturing division will become a portion of the chemical division of the parent Smith-Douglass Company.

San Jacinto will also become a portion of the chemical division of the parent Smith-Douglass Company. Dave A. White is manager of San Jacinto, which produces anhydrous and aqua ammonia, at the San Jacinto ordnance works at Channelview, near Houston, Texas.

In making the announcement, Smith-Douglass vice president R. S. Rydell emphasized that no product specifications or manufacturing facilities were being changed. Individual manufacturing divisions will in the future be identified only as the Smith-Douglass Company, Inc.

International Paper

A reorganization of the manufacturing department of the Bagpak division, International paper Company was announced by A. A. Scholl, general manager.

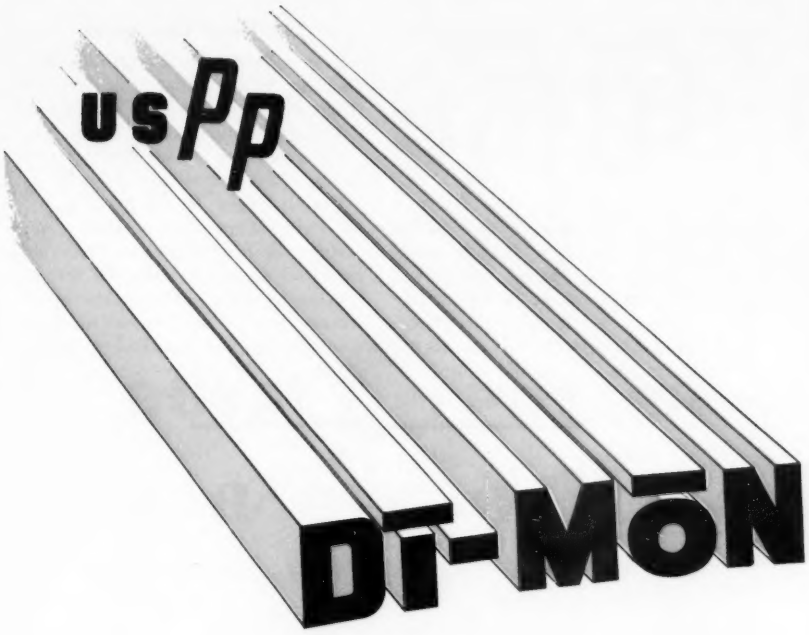
Three divisional staff members have been appointed who will report directly to C. B. McCord, manager of manufacturing, located in Camden, Arkansas. Production managers have also been appointed for the company's multiwall bag operations in Camden, Mobile, San Jose and Litchfield.

Mr. Scholl announced that A. S. Morgan was named division production manager; A. R. Davis, division engineer; and H. C. Roper, division director of industrial relations. All three will have their headquarters in Camden, Arkansas.

Production managers appointed for the four operations were E. R. Fogle, Camden, Arkansas; J. A. Horne, Mobile, Alabama; W. M. Cathey, San Jose, California; and A. C. Kuehn, Litchfield, Illinois. All are veterans of more than 25 years' service with the company.

Electric Reduction

Electric Reduction Company of Canada Ltd. has announced the pur-



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chase from Dominion Fertilizers Limited, of a chemical fertilizer plant at Fort Maitland, Ont.

The plant produces phosphatic fertilizers. Its activities will be linked with the multi-million dollar chemical project which Electric Reduction announced last year for the Port Maitland area.

Dorr-Oliver

Dorr - Oliver Incorporated announces the appointment of Equipment Engineers, Inc. of Philadelphia, Pennsylvania, as sales and service representative for Dorr-Oliver process pumps in the major industrial counties in Delaware and Maryland. The prominent equipment distributor will continue to serve industry in eastern Pennsylvania and southern New Jersey—territories in which they have represented Dorr-Oliver over the past three years. They are headquartered at 331 East Lancaster, Avenue, Wynnewood, Pennsylvania. Fred Acord has been named by Equipment Engineers as resident engineer in the Delaware-Maryland area.

Yale

The El Paso Flournoy Company, Inc., a leading Southwest industrial equipment supplier for the past 13 years, has been appointed West Texas and Southeastern New Mexico franchise representative for Yale industrial lift trucks and tractor shovels by Clyde R. Dean, general sales manager, Yale Materials Handling Division, The Yale & Towne Manufacturing Co.

Located at 1224 E. Missouri St. in El Paso, the new Yale sales and service outlet is presently constructing a new building that will double their present area for replacement parts inventories and service shop facilities.

Du Pont

Formation of a new department to consolidate and strengthen research, manufacturing, and marketing efforts on behalf of a wide range of agricultural and industrial products was announced by the Du Pont Company.

To be known as the Industrial and Biochemicals Department, the new department will encompass all operations of the Grasselli Chemicals Department, together with operations of the Polychemicals Department in agricultural chemicals, industrial chemicals and anti-freeze.

Clark W. Davis, general manager of the former Grasselli Chemicals Department, will be general manager of the new department. Walter H. Salzenburg will continue as general manager of the Polychemicals Department. With few exceptions, other personnel will continue in the same locations and same assignments as heretofore.

FEECO, FCC

Fertilizer Engineering and Equipment Company, Inc. and Fertilizer Construction Company, Inc. Offices and Manufacturing Plant are now situated in new and expanded facilities. The new address is Sturgeon Bay Road, Route 1, Green Bay, Wisconsin. The telephone number remains the same—Hemlock 7-5489.

Highway Equipment

Rivers Trailer & Equipment Inc., Jacksonville, Florida, is a new distributor for Highway Equipment Company, Cedar Rapids, Iowa.

Their address is 2304 North Myrtle Avenue, Jacksonville 4, Florida.

Power Brake & Equipment, Inc., St. Paul, Minnesota, is also a new distributor for Highway. They will serve all of Minnesota with the exception of ten counties in the northwestern corner of the state and four counties in the southwest corner. Address: 2417 University Avenue, St. Paul 14, Minnesota.

HONORS

Frederick Koechlein (left), general manager of the Phosphate Division of International Minerals & Chemical Corporation receives 30 year employment pin from George Moyers, division vice president, at ceremony in IMC's Skokie, Ill., headquarters. Koechlein, a graduate of Rutgers University, joined IMC as assistant production manager of the division May 1, 1929. He has been general manager since 1951.

The United States Army Chemical Corps has paid special tribute to **W. Ward Jackson,** vice president of **Commercial Solvents Corporation,** in ceremonies held at the Army Chemical Center, Edgewood, Maryland, according to an announcement by Major General Marshall Stubbs, Army Chief Chemical Officer.

Mr. Jackson, the past president of New York Chapter, Armed Forces Chemical Association, was given a plaque and certificate of achievement for outstanding contributions to the Army Chemical Corps by General Stubbs. Present at the ceremony were over 70 of Mr. Jackson's fellow industry associates.

Howard Parker, president of **Parker Fertilizer Co.,** Sylacauga, was named to the Alabama State Board of Agriculture and Industry by the governor.

George Huckle of the **Shell Chemical Company** will serve the **Association of British Manufacturers of Agricultural Chemicals** as chairman during the year 1959-60.

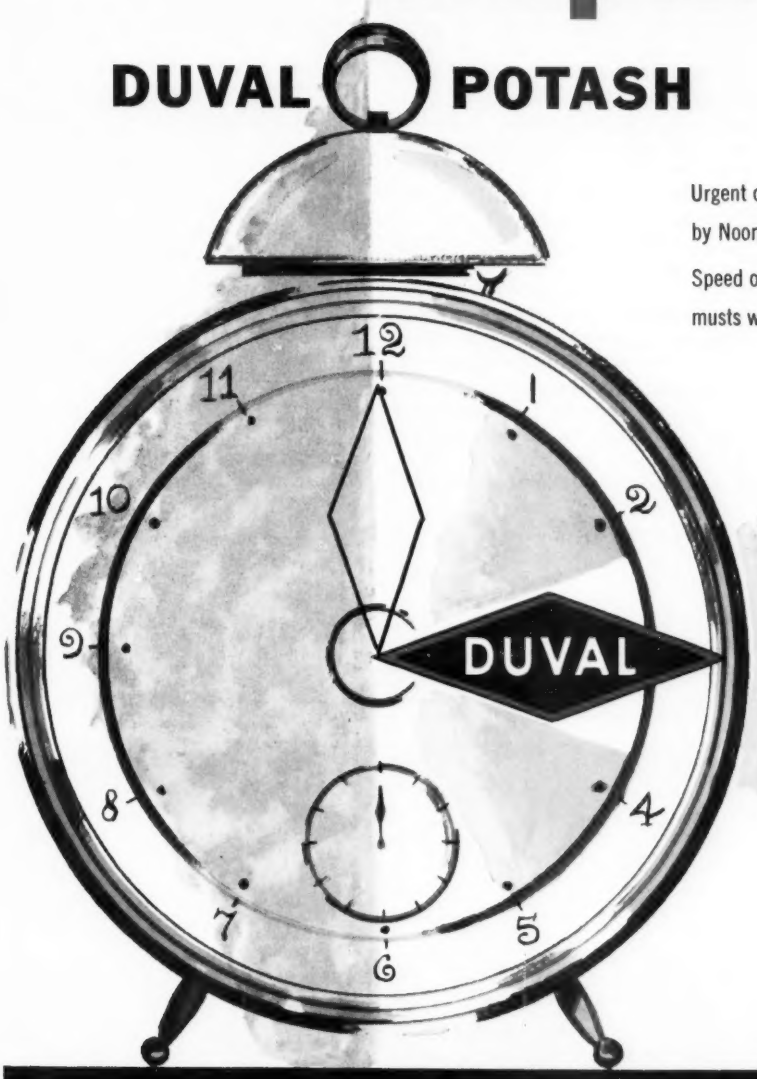
R. J. Martz, manager of the **Diamond Alkali** Co. Belle Plant, announced that E. J. Stanley was presented with a 35-year service pin at the annual awards dinner. Awards also were presented to L. C. Sheets and W. H. Palmer for 25-years service.

CRESTED CLOVER AWARD

Presented to Olin Mathieson's Sam Nevins, June 16, the Award of the Crested Clover from the Extension Service at the 4-H Conference dedication services of the new 4-H center in Washington — for his efforts in securing the sponsorship of his company for the National 4-H Alumni Recognition Program, his leadership in this program that made possible his election to the Board of Directors of the National Committee on Boys and Girls Club Work, and his interest in alumni winners in the States. Sam and Mrs. Nevins are shown here as they arrived back at The Greenbrier's NPFI meeting following the presentation in Washington. They had flown down in the O-M plane early that morning and returned the same day.

same day shipment

DUVAL POTASH



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400 SEE NEW TVA DEVELOPMENTS

Discussion and demonstrations of granular and liquid fertilizer production drew nearly 400 industry representatives to the Tennessee Valley Authority's chemical development center at Muscle Shoals, Ala. June 9-11. Management, technical production personnel from 35 states and Puerto Rico represented about 75% of the U. S. fertilizer industry's production capacity. In addition, there were representatives from Canada, Cuba, England and Belgium. About 80% of the group was from private industry, one-sixth from cooperatives, and the remainder consisted of specialists from state agricultural colleges and the U. S. Department of Agriculture.

The initial day of the conference was principally concerned with nitrogen losses in granulation, the second day with production of high nitrogen and no-nitrogen granular goods, and the final day with liquid and salt-suspension fertilizers. Each session was followed with a tour of the pilot plant operation illustrating the discussion.

Arnold R. Jones, TVA board member, welcomed the group. He was introduced by Charles H. Young, manager of TVA Chemical Engineering. Mr. Jones, citing that TVA production amounted to only about one per cent of the nation's total fertilizer output, emphasized that the purpose of the authority was to improve fertilizer and lower its cost to the farmer. He explained that a healthy, profitable fertilizer industry is necessary to carry out these objectives.

"Improved technology is one of the important ways through which industry in all fields lowers its costs and improves its earnings," Mr. Jones concluded. "This demonstration is meant to provide assistance to that end. We have no secrets. All our patents and the results of our work are open to you without royalty."

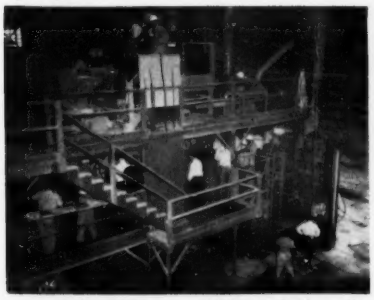
J. H. Walthall, director of the Division of Chemical Development, outlined the organization's program of research and development, covering its history and current activity.

Travis P. Hignett, who heads the Applied Research Branch for the division, reviewed the 18 years of work the agency has done on fertilizer ammoniation and granulation, illustrating with film slides some of the eqiupment used in this work. He introduced the topic of nitrogen losses and discussed some of the problems which have confronted the industry in this respect. He cited several ways in which this proves expensive to the fertilizer manufacturer: value of nitrogen lost, shrinkage in weight of end product, penalties and potash overages, and unfavorable publicity and ill will. These losses cost the industry several millions of dollars annually, he estimated.

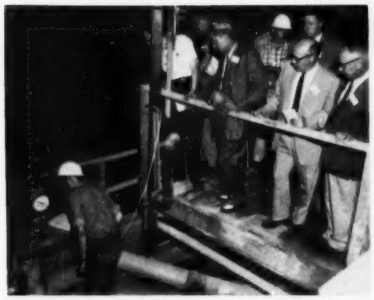
Alvin B. Phillips, chief of the Process Engineering Branch, carried the topic further with a description of

1. Henry Troyer, Green Dew Farm Chemicals, Plain City, O.; Norman Godden and Don Humphrey, Flo-Lizer, Inc., Kingston, O.
2. Chuck Everhart of Danville, Ill.; Tom Martin of Champaign, Ill, both with U. S. Industrial Chemicals; Melvin Leach and Dale Morris, Indiana Farm Bureau Coop., Indianapolis; Bob Magness, U. S. Industrial Chemicals, New York.
3. Joe Reynolds, Davison Chemical Co., Baltimore; L. C. Clegg and E. C. Doidge, Canadian Industries, Ltd., Montreal; and J. S. Lewis, Jr., TVA, Wilson Dam.
4. Bill Howe, Howe, Inc., C. O. Rost, Minnesota Farm Bureau; Roy Howe, Howe, Inc., and Howard Gooler, Minnesota Farm Bureau, all from Minneapolis.
5. Joe Prosser, A. J. Sackett & Sons, Baltimore; W. H. Mitchell, Tennessee Farmers Coop., LaVergne; and A. J. Sackett, Jr., A. J. Sackett & Sons Co., Baltimore.
6. Charles Rohn and Victor Busenbark, Barko Fertilizer, Ladoga, Ind., and Loren Johnson, U. S. Steel Corp., Pittsburgh.
7. Charlie McDaniel, Alabama-By Products Corp., Birmingham; Cecil Alvis and Earman Perry, C. O. Smith Guano Co., Moultrie, Ga.; and Phil Neal, Jr., Alabama-By Products Corp., Birmingham.
8. Jerry Kemp of Indianapolis and T. R. Schmalz of Norfolk, both with F. S. Royster Guano Co., Norfolk; and Frank Nielsson, International Minerals & Chemical Corp., Skokie.
9. Kirk Sanders, Spencer Chemical Co., Atlanta; Newton Crouch, Crouch Fertilizers, Griffin, Ga., and B. E. Adams, Allied Chemical Corp., Nitrogen Div., Hopewell, Va.

Visitors climbed platforms around ammoniator pilot plant. . .



. . . and peered at activities of the pilot plant personnel. . .



. . . studied construction of the ammoniator and granulator. . .

. . . examined the product falling into the chute to the cooler. . .

. . . peered at cooled granules on flight conveyor to screens. . .

studies TVA has made on nitrogen losses in 12-12-12 production. (See page 46 for full coverage of this discussion.)

E. D. Schall of the Biochemistry Department at Purdue University (which is responsible for administration of Indiana's fertilizer control program) outlined some of the difficulties encountered by mixers in that state, and described the studies undertaken to correct a consistent nitrogen deficiency on 12-12-12 formulations by about half the plants there. He stated that a determination of only 11% nitrogen was not uncommon on 12-12-12 grades analyzed in Indiana, while P_2O_5 and K_2O in the same samples frequently ran to 13 or 13½ units.

In examining plant conditions contributing to the losses, he said that the department had determined that the nitrogen losses were not incurred in storage. Studies were conducted on 12-12-12 runs formulated with 9.9 units of ammoniacal nitrogen and 2.2 units of nitrate nitrogen, with a chloride-nitrate ratio of 3:1. Studies on goods of this sort were performed at elevated temperatures. After one hour at 356° F., analysis showed that 16% of the nitrogen was gone, and further that 95% of the nitrate nitrogen was missing. With the addition of ammonium sulfate or potassium sulfate to the formulation, he showed how nitrogen losses were decreased. Dr. Schall's talk pointed out how cooperation between plant management and control offices can work to the advantage of both.

After lunch, the pilot plant was opened to the group and production of 12-12-12 in a continuous ammoniator was demonstrated. Halfway through the production schedule, the rate of throughput was cut to half the initial rate to illustrate the marked reduction in fuming at the ammoniator. Also on display was the apparatus used in measuring nitrous oxides in effluent gases from the operation.

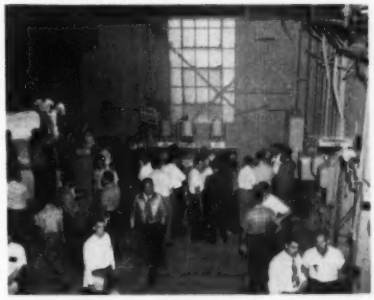
The second day featured a split session, with R. D. Young describing production of high-nitrogen grades such as 20-10-10 in the continuous ammoniator at the morning session, followed by another tour of the pilot plant—where a granular 20-10-10 was being produced using a 30-10-0 ammonium phosphate nitrate as the basic material—after a discussion period.

That afternoon, Mr. Young described production of granular no-nitrogen grades to the group in the auditorium. After another discus-

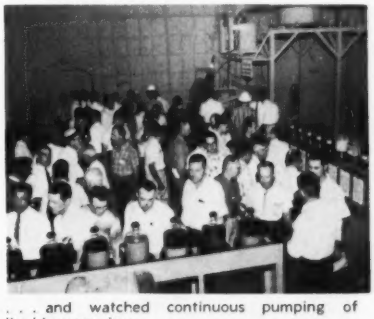
. . . sampled on-size material coming off classification screens. . .

. . . observed apparatus for recovering decomposition products. . .

. . . watched liquid 8-24-0 being made from wet process acid. . .



. . . studied stored samples of liquid and salt suspension mixes. . .



. . . and watched continuous pumping of liquid suspensions.

sion period, the meeting adjourned to the pilot plant once more to observe production of an 0-25-25 grade using the phosphate rock-phosphoric acid reaction to promote granulation.

The final day of the meeting was given over to a conference on liquid fertilizers. Although many of the solid-fertilizer men left the meeting at the end of the second day, at least as great a number of liquid fertilizer operators appeared to replace them.

A. V. Slack, chief of the Program Development Staff, presided at the liquid conference, and began the session with an appraisal of the status of liquid mixed fertilizer technology.

George Stanford, who heads up TVA's agronomic evaluation activities, was next on the platform, with a summary of the comparative agronomic value of liquid and solid fertilizers.

C. M. Hanson of the agricultural engineering staff at Michigan State University reviewed various types of equipment for applying liquid fertilizers, and discussed merits of their components for use with liquid materials of different characteristics, and for different application methods.

M. M. Striplin, Jr. described TVA's work with production of liquid fertilizers from superphosphoric acid, and J. M. Potts told of the work on liquid fertilizers using caustic potash and superphosphoric acid.

W. C. Scott, Jr. introduced the topic of wet process phosphoric acid in production of liquid mixed grades. Sequesteration of this 'green' acid with superphosphoric acid was outlined by J. A. Wilbanks, and M. R. Siegel told how concentration of the wet process acid can give it self-sequestering properties. J. M. Stinson concluded the panel on wet process acid with a discussion of methods of suspending the precipitated impurities.

H. K. Walters, Jr. discussed the agency's work with salt-suspension fertilizers.

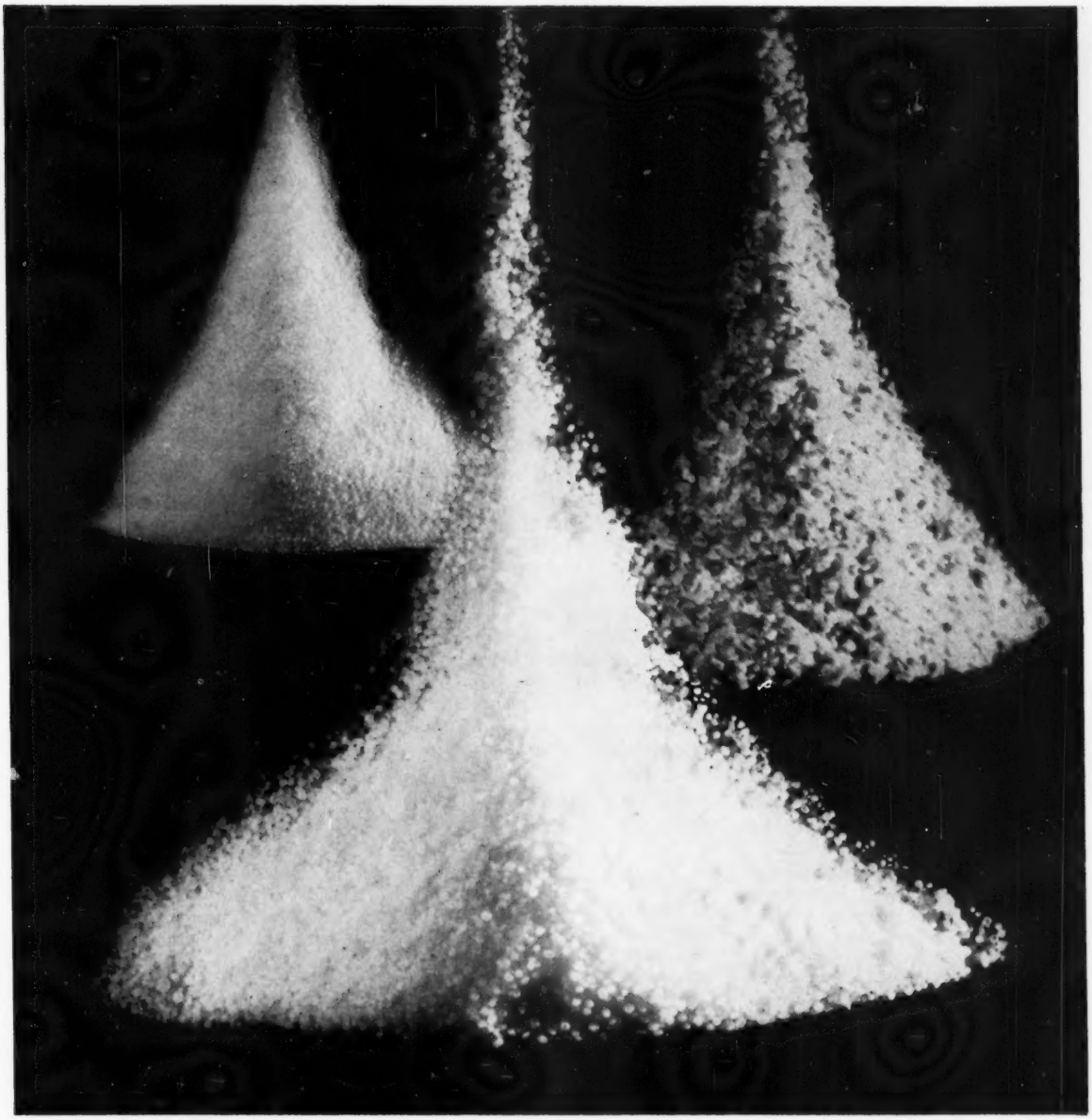
Following a discussion period and adjournment for lunch, the group visited the chemical engineering laboratory to observe exhibits and process demonstrations on the topics described during the morning session.

Under way at the laboratory were production of 0-23-23 liquid fertilizer with caustic potash and superphosphoric acid, and production of liquid 8-24-0 with wet process phosphoric acid by sequestering impurities with 11-33-0 made from superphosphoric acid.

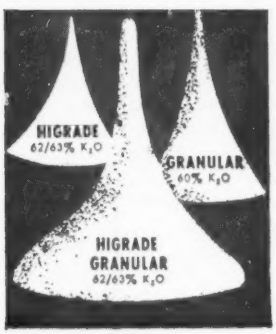
Also in continuous operation was a demonstration of pumping and spraying suspension fertilizers. Exhibited in jars on carefully-labeled boards were samples of various grades of liquid and suspension fertilizers, tagged as to the period of time each had remained in unagitated storage.

Throughout the conference, tours were offered through the various full-scale production plants operated at the development center, and storage bins of many experimental products were open to view for the visitors, with sample bottles available for carrying home specimens of the products.

1. Raymond Myers of York, Pa., and Rodger Smith of W. Springfield, Mass., both with Eastern States Farmers Exchange.
2. Larry Hein, Olin Mathieson Chemical Corp., Joliet Ill.; M. Pearce and W. F. Sheldrick, Fisons, Ltd., Felixstone, Suffolk, England.
3. Charles Tomlin and Val Ginn, Ohio Valley Fertilizer Corp., Maysville, Ky.; Joe Marsh, Burley Belt Plant Food Works, Lexington, Ky.; and Herbert Moore, Ohio Valley Fertilizer Corp., Maysville, Ky.
4. E. H. Felty and H. J. Trammell, Farmers Fertilizer Co., Texarkana, Texas; Manuel Sierra, Productora de Superfosfatos, Havana, Cuba; and Allen Jackson, Fertilizer Equipment Sales Corp., Atlanta.
5. R. E. Szold of Sterlington, La., and Loy Everett of New York, both with Commercial Solvents Corp.; Jim Champion, III, and Jim Champion, Jr., both with Albany Warehouse Co., Albany, Ga.
6. Pete McBride, U. S. Potash Co., Kansas City; Lowell Sandven and Kenneth Abens, Sandven Chemical Co., Humboldt, Iowa; Ed Kapusta, U. S. Potash Co., New York.
7. J. E. Countess, Baugh & Sons Co., Al Spillman, Fertilizer Manufacturing Corp., and Gus Mautner, Baugh & Sons Co., all from Baltimore.
8. Rex Reagan, U. S. Industrial Chemicals, Indianapolis; Harvey O'Neall, Kingsbury & Co., Peru, Ind.; Harold Kitchens, U. S. Phosphoric Products, Minneapolis; Ed Kingsbury, Kingsbury & Co., Indianapolis.
9. Fred Ioerger, Marion Plant Life Fertilizer Co., Marion, Ohio; and Bert Tucker, Sohio Chemical Co., Lima, Ohio.
10. Mercer Rowe of Atlanta and Tom Richardson of Montgomery, both with Ashcraft-Wilkinson Co.; L. C. Salter, Associated Cooperatives, Sheffield, Ala.; Sheldon Clement, TVA, Knoxville; and A. E. Buter, Allied Chemical Corp., Nitrogen Div.
11. Dave Edwards, Monco Liquid Fertilizers, Monmouth, Ill.; W. E. Houghton, Gen. Chemical Div., Allied Chemical Corp., New York; Ike Swisher, Allied Chemical Corp., Nitrogen Div., Indianapolis; Edwin Aylward, Aylco Fertilizer Div., Sullivan, Ill.; Joe Hamilton, Monco Liquid Fertilizers, Monmouth, Ill.; and Elmer Perrine, Allied Chemical Corp., Nitrogen Div., New York.
12. Grayson Morris, Cooperative Fertilizer Service, Richmond; and W. S. Yowell, American Agricultural Chemical Co., New York.
13. Joe Markey, Tennessee Corp., College Park, Ga., and Archie Slack, TVA, Wilson Dam.



Better fertilizers begin with three non-caking grades of USP potash



USP's *three* outstanding grades of potash are specially refined to resist caking and remain free-flowing from manufacture to application. And all three are specially sized, too, in perfect grades to meet all modern fertilizer requirements. Two white grades—Higrade muriate and Higrade Granular muriate—each give you more potash per ton (62/63% K_2O) than any other potash available. And USP's Granular muriate (60% K_2O) is ideal for products where a still larger particle size is required.

For complete technical data and shipping information, contact the United States Potash Company. Our expertly staffed Technical Service Department welcomes your inquiries.

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DIVISION OF UNITED STATES BORAX & CHEMICAL CORPORATION
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Southern Sales Office: Rhodes-Haverty Building, Atlanta, Georgia

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PEOPLE in the Industry

Smith-Douglass

M. W. Mawhinney has been appointed manager of the Streator, Illinois operation of the Smith-Douglass Company, vice president J. H. Culpepper has announced. Mack A. Glass has been named to succeed Mr. Mawhinney at Albert Lea, Minn. R. G. Fitzgerald, who was manager at Streator, has been named manager of contract sales.

Mawhinney

Glass

Fitzgerald

Mr. Mawhinney joined Smith-Douglass in 1945. Mr. Glass joined Smith-Douglass in 1947.

E. P. Chandler has been appointed western manager, feed phosphorus sales, by the Smith-Douglass Company. John L. Lindsay will be transferred to Texas City to assist Mr. Chandler in sales representation for Coronet Granular Dikal in the western half of the United States.

P. C. Borax

Robert T. Edgar has been named vice president in charge of production of the Pacific Coast Borax Co., a division of United States Borax & Chemical Corp. Mr. Edgar formerly was manager of manufacturing with Ethyl Corp. of Canada.

Collier Carbon

C. B. Hobbs and William R. Van Liere have been appointed staff assistants to the manager in agricultural sales development, Collier Carbon and Chemical Corp.

Olan R. Genn was named area manager in agricultural chemical sales for Southern California and Arizona.

Connecticut AES

The oldest agricultural experiment station in America spruced up June 9 to honor a distinguished former director, William L. Slate, to dedicate a new laboratory, and to hear both comfortable and challenging words from distinguished men who know the programs and the problems of research underway here.

Standard of California

Appointment of Fred Powell to head up Standard Oil Company of California's stepped up sales and manufacturing activities in the chemicals field was announced by G. L. Parkhurst, Standard vice president and director.

Mr. Powell becomes president of California Chemical Company, Standard subsidiary which coordinates the parent company's chemical operations, with W. H. Shiffler named vice president. Mr. Parkhurst continues as chairman of the board of California Chemical, in addition to his other assignments with Standard.

Pennsalt

Pennsalt Chemicals Corporation has appointed David T. Tyler midwest supervisor for the company's line of B-K cleaners and sanitizers. He replaces W. C. "Pete" Carpenter, who moves to a supervisory post in the Western region.

Mr. Tyler will supervise a nine-state territory, including Illinois, Indiana, Iowa, Michigan, Minnesota, Nebraska, North Dakota, South Dakota, and Wisconsin.

Stauffer

Stauffer Chemical Company announces the promotion of Larry E. Prince to the position of agricultural chemicals sales supervisor for North and South Carolina, Alabama, Georgia, Tennessee and Northern Florida. Mr. Prince joined Stauffer in 1951.

Bemis

Bemis Bro. Bag Co. has announced the election of C. C. Hammer as treasurer. Mr. Hammer succeeded T. W. Little, who retired May 31. He joined Bemis on December 1, 1958. Mr. Little retires after more than 40 years of service with Bemis.

Chase

Alexander

Gosney

Chase Bag Company has appointed Eugene P. Alexander sales manager of its paper bag division, with headquarters in New York. The announcement was made by R. H. Ayers, vice president in charge of the division.

Mr. Alexander has been manager of the Chase Bag Company sales office in Chicago since 1957 and prior to that he was sales manager. He joined the firm in Detroit in May 1948.

William J. Gosney, a sales representative for Chase Bag in Chicago since 1956, succeeds Mr. Alexander as manager of that office He has been with the firm for ten years.

U. of Massachusetts

Dr. Dale H. Sieling, dean of the College of Agriculture at the University of Massachusetts, has been appointed scientific director of the U. S. Army Quartermaster Research & Engineering Command, Natick.

He will assume his new post in July. Dr. Sieling also is director of the Massachusetts Agricultural Experiment Station and the Cooperative Extension Service.

Spencer

New assignments involving key agricultural chemicals division personnel were announced by Spencer Chemical Company, according to Jack C. Denton, vice president, agricultural chemicals. The reassignments, for purposes of cross-training, will "add considerable breadth to the management capabilities of the individuals," Mr. Denton said in announcing the changes.

Byron M. Kern, general manager of production, will assume the duties of general sales manager. Harold E. Bingham, general sales manager, will take control of the development of new products, including "Carbyne," the new Spencer herbicide now undergoing promising field trials. Harold Ihde, director of marketing, will assist Mr. Bingham in this effort.

Jack E. Straub, assistant to the vice president, will coordinate production activities in the office of the general manager of production.

USI

Johnson

Stanton

Warren E. Johnson and George H. Stanton have been named to fill new sales management positions by U. S. Industrial Chemicals Co., division of National Distillers and Chemical Corporation. Announcement was made by Alden R. Ludlow, U.S.I. vice president in charge of sales.

Mr. Johnson is appointed director of chemical sales, with the manager of each product group reporting to him. Mr. Stanton, who will assume the position of director of field sales later in the year, will supervise the activities of regional sales offices. The new appointees will report to Mr. Ludlow.

Texaco

Texaco Inc. today announced the appointment of Allan F. Dow as petrochemical sales supervisor for the Midwest, with headquarters in the McCormick Building, Chicago.

Dow

Mr. Dow will supervise the marketing of nitrogen products, solvents, chemical intermediates, and corrosion inhibitors manufactured by Texaco.

Charles B. Fischer has been named Texaco's petrochemical sales representative to fertilizer manufacturers and other users of ammonia and nitrogen solutions in Indiana, Michigan, Ohio and Kentucky.

His headquarters are at the Central Region Sales Office of Texaco Inc. in the McCormick Building, Chicago.

Mr. Fischer has worked for Texaco since 1949, as an industrial salesman in the southern states and, more recently, as a member of the Company's foreign sales staff in Santiago, Chile.

Yale

Donald L. Frazer, veteran of 6 years in Yale materials handling equipment export sales in South America, has been appointed Yale factory representative for all of Latin America.

St. Regis

St. Regis Paper Company announces that Howard C. Peterson, Jr., who has been associated with the company's Kraft Division, has been appointed to the new sales post of corporate account executive. In this capacity, he will work with major accounts.

Mr. Peterson, who will serve on the executive sales staff and report directly to Arch Carswell, executive vice president—sales and marketing, joined St. Regis in 1952 and has served in various executive sales positions with the company.

Cyanamid

Dr. Thomas H. Jukes, with them since 1942, has resigned his post as director of research for American Cyanamid Company's Agricultural Division to accept the position of vice-president in charge of research for Nutrilite Products, Inc., Buena Park, Calif.

Dr. E. L. R. Stokstad, the first scientist to establish the growth-promoting effect of antibiotics on animals, has been appointed to the post, it was announced by Frank S. Washburn, division general manager.

Richardson Scale

The appointment of A. E. (Gene) Stephens as district manager for Colorado, covering the entire state of Colorado and the southern half of Wyoming, was announced by Richardson Scale Co., manufacturers of automatic weighing machinery.

Mr. Stephens has served Richardson for a number of years at Wichita and is now covering the new territory which was formerly covered under an agency arrangement concluded at the end of 1958. A new office will shortly be opened in Denver.

Calspray

The election of M. E. Wierenga to vice-president and member of the board of directors of California Spray-Chemical Corporation was recently announced by A. W. Mohr, president, following a meeting of the Calspray board. Simultaneously, Mr. Wierenga was appointed to the position of manager, marketing department, moving from the foreign department, which he has managed for the past four years. Mr. Wierenga has been with the company for the past 12 years.

Ala. By-Products

Appointments to three key positions in the Sales Department of Alabama By-Products Corporation, Birmingham, Ala., were announced by R. H. Norris, Jr., vice president—sales.

Bolvig

Axel Bolvig, Jr., was promoted to assistant manager, coal chemical sales; James T. Sparrow, Jr., to assistant manager, nitrogen sales, and Charles L. McDaniel to nitrogen market research and product development specialist.

Sparrow

McDaniel

Mr. Bolvig's activities will be devoted to marketing of both foundry coke and coal chemicals produced by Alabama By-Products. Mr. Sparrow's enlarged duties will be in the marketing of nitrogen chemicals produced by Ketona Chemical Corporation, Ketona, Ala. Alabama By-Products is joint-owner and exclusive sales agent for Ketona Chemical.

Mr. McDaniel, a specialist with broad experience in his field, will be engaged in market research and product development studies on nitrogen products.

Fischer & Porter

A. R. "Ace" Hughes, formerly manager of the Philadelphia district office of Brooks Rotameter Company, has been named to the newly-created position of special projects engineer by Fischer & Porter Co.

Dorr-Oliver

Dorr-Oliver Incorporated announces the retirement of Arthur Terry, Jr., as vice president for international administration and as a director of the company. Closely associated with D-O international business affairs for most of his 38 years of service, Mr. Terry will continue to serve Dorr-Oliver after his retirement as a consultant in the international field. Vice president Douglas C.

Reybold, former director of technical operations, has assumed guidance of all international operations.

Agrico

Dr. Donald P. Satchell has been named manager of agronomic services for The American Agricultural Chemical Company, W. J. Turbeville, Jr., vice president in charge of fertilizer sales, has announced. He replaces O. C. Leetun, who has requested to be relieved of administrative duties because of ill health. Mr. Leetun, who has been with Agrico for 40 years, will remain active in an advisory capacity, Mr. Turbeville said.

Satchell

Leetun

Thorne

B. E. Thorne has been named Agrico sales manager for New England. He will continue to be located at North Weymouth, Mass., where he has been assistant manager since 1955. He replaces J. J. Graham, who recently transferred to the Company's general credit office in New York.

A. F. Vetter, former production superintendent at Agrico's Washington C. H., Ohio, plant, has been named division maintenance superintendent for the Company's Northeastern division, D. S. Parham, vice president in charge of production, has announced.

Replacing Mr. Vetter at Washington C. H. is A. W. Powell, formerly located at Alexandria, Va.

J. F. Watkins, formerly assistant superintendent at Agrico's Fulton, Ill., plant, becomes superintendent at Alexandria.

Choonjoo

John J. O'Leary, a prominent figure in the synthetic ammonia industry for nearly 40 years, left for Korea June 19 to become plant manager of Korea's new $35,000,000 urea fertilizer facility at Choonjoo.

Mr. O'Leary was formerly with Allied Chemical and American Cyanamid.

RED FACE DEPT.

Somehow, we pulled a real boner in the June issue. Between the time page proofs were okayed and the magazine came off the presses, the pictures of Virginia-Carolina's Charlie Harding and Curtis Cox got switched.

We doubt, however, if any of our readers were fooled, as both of these men have long been active in industry circles. Charlie Harding, with V-C for 41 years, was manager of manufacturing before being made vice president last March, and is now executive vice president of the company. Curtis Cox, now manager of manufacturing, was formerly assistant manager of manufacturing, and is a past general chairman of the Fertilizer Section, National Safety Council.

Joint Meeting Talks Application

The thirty-fifth annual meeting of the National Joint Committee on Fertilizer Application, in cooperation with the Power and Machinery division of the American Society of Agricultural Engineers, met at Cornell and talked 1. placement and 2. precision agricultural equipment. USDA's W. C. Hulburt presided.

State Level Group In South Dakota

The local-level South Dakota Fertilizer Association, which has been in process of formation for some months, has now been formally organized. Dealer and Industry voting memberships have been established, with provision for non-voting members and guest members.

The board includes four dealers and three from the industry. Clarence Schladweiler, farm service owner, is chairman. Andy Anderson of Dakota Fertilizer is vice-chairman. Wesley Martin, Brookings County Farmers Union man, is secretary-treasurer.

Solutions Men Meeting Nov. 8-10 In St. Louis

The 1959 Convention of the National Fertilizer Solutions Association will be held November 8-10, at the Statler Hilton Hotel in St. Louis, Missouri, it has been announced by executive secretary Muriel F. Collie.

Safety Section Sets up 5 Schools to Cover U.S.A.

The Fertilizer Section, National Safety Council has accepted for presentation to the October meeting in Chicago, this slate of officers: Elmer Perrine, Nitrogen Division, chairman; Ansell Raney, Phillips Chemical, vice-chairman; Gaither Newman, Smith-Douglass, secretary.

With the cooperation of NPFI, the Fertilizer Section announces a series of safety schools in August and November. Five of these schools—see schedule—cover the US and supply an opportunity for every fertilizer plant in the nation to do something about improving its safety record, via the latest information on the subject.

The following schedule of the first of these meetings will serve as an example of the thorough way they have been planned, and the wealth of helpful material which will be offered.

SAFETY SCHOOLS	REGIONAL	LOCATION	DATE	DIRECTOR	ASSISTANT
	Northeast	Ithaca, N. Y.	Aug. 12-13	Stratton McCargo	George Dietz
	Midwest	Chicago, Ill.	Aug. 18-19	John Smith	Roger Hugg
	Southeast	Atlanta, Ga.	Aug. 27-28	Quentin Lee	William Stone
	Far West	Fresno, Calif.	Nov. 5-6	Orm Chinnock	A. R. Cline
	Southwest	Houston, Tex.	Nov. 12-13	Ansell Raney	Horace Kelley

C. H. Robertson, vice president of Albemarle Paper Manufacturing Co., second from left, presents bronze plaque to Raymond Bag Company officials for the best safety record over the past year in all Albemarle divisions. Witnessing the presentation are (l. to r.) C. L. Mers, board chairman; Robertson; J. R. Clements, president; Paul R. Cretors, plant manager; and Herbert C. Phelan, personnel manager.

THE MAN WITH THE MULTIWALL PLAN

UNION PACKAGING SPECIALIST BOB BUCK

lowers customer's bag costs $35,000 annually

A little weight reduction can go a long way in trimming Multiwall costs. Union Packaging Specialist Bob Buck demonstrated just how far during a study of one company's bagging operation.

The company had been using a baler bag of 160# total basis weight. Union's analysis proved that a 70/70 bag would be equally effective. The 20# reduction resulted in a savings of $35,000 a year.

This economy came through Union's 5-Star Packaging Efficiency Plan. Among the other improvements were: (1) A new, revised specifications manual which simplifies and streamlines inventory control. (2) Standardization of all bag printing. This assures delivery of completely uniform print copy from the firm's various suppliers.

Union Multiwall Recommendations are based on this 5-Star Packaging Efficiency Plan

- DESIGN
- EQUIPMENT
- CONSTRUCTION
- SPECIFICATION CONTROL
- PLANT SURVEY

Union's plan is producing thousands of dollars worth of savings for Multiwall users, large and small. It might point the way to a greater return on your packaging investment. Write for details.

Better Multiwall performance through better planning

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UNION'S PACKAGE ENGINEERING DEPARTMENT will study your Multiwall bagging methods and equipment and make appropriate recommendations, regardless of the brand of Multiwalls you are now using.

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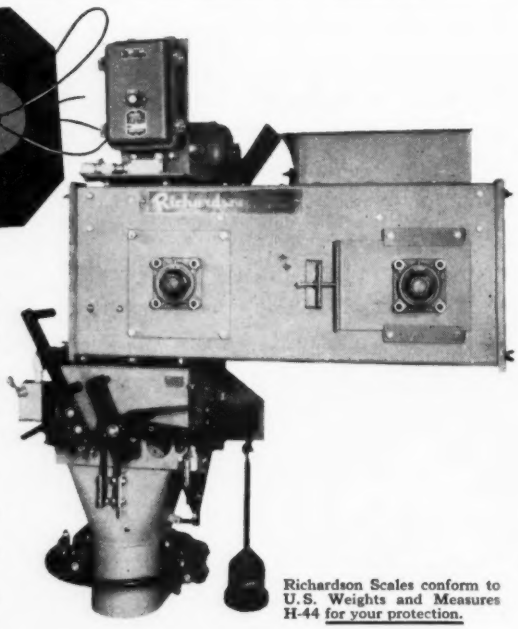
For just $1610 a RICHARDSON GA-17 FERTILIZER SCALE

gives you modern, high-speed bagging



The low, low cost attached to this outstanding *Richardson Fertilizer Scale* makes it an ideal unit for both small and large output operations. Maximum speed with excellent accuracy assures the user of both economical bagging and elimination of "give-away."

Only the Richardson GA-17 offers the fertilizer producer all these features at this price.

- **fast, precise bagging**—up to ten 100-lb. bags per minute
- **simplicity of design**—only two units; E-10 Belt Feeder and GA-17 Bagger
- **ease of operation**—just attach the bag and pull handle
- **eye-level weight indication**—balance indicator operates on torsion principle
- **corrosion-resistant stainless steel plates**—where contact is made with fertilizer
- **minimum head-room required**—scale also available in a floor portable frame
- **service always available**—from Richardson's nationwide facilities ... within 24 hours if desired

For higher-speed production the Richardson HA-39 provides bagging rates up to 24 bags a minute at 2 oz. accuracy.

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Bulletin 2510 illustrates and describes in pictures and text the proper relationship between:

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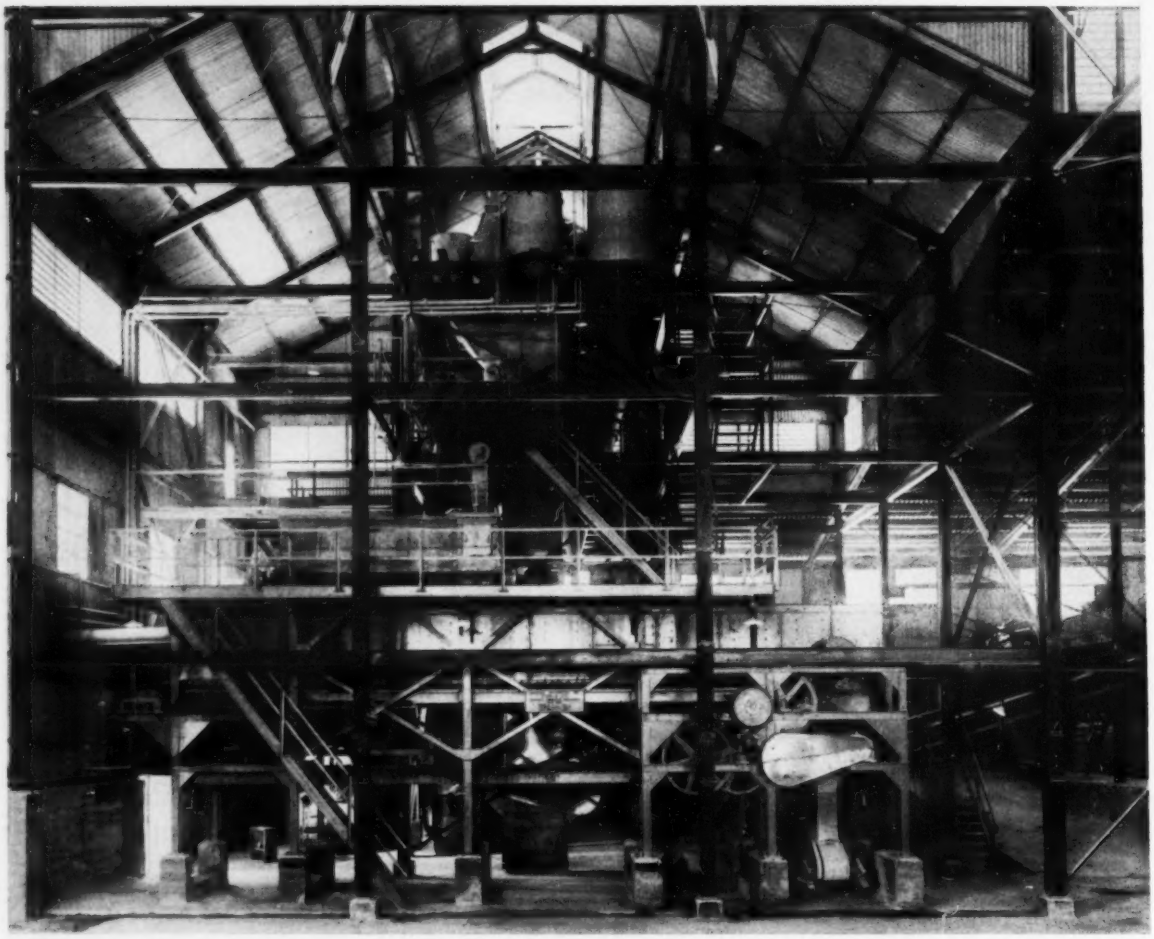

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● Users of the Original Broadfield superphosphate plant report High Conversions—20.5% Available P_2O_5 with 7% Moisture from 75% B.P.L. phosphate rock in 14 days or less time.

● Finished product of excellent mechanical condition, and where desired about 50% of output can be of hard granular form, 1/8" 3/16" sizes.

● Output of 10 tons up to 90 tons per hour of Shrunk 20% superphosphate.

● Uses 77-80% or 93-96% sulfuric acid directly into the mixer with no pre-diluting expense.

● The Broadfield being a closed system, escape of gas fumes is at a minimum.

● Actual operating records show that maintenance costs are about 5c per ton of superphosphate produced.

● As of this date 115 Original Broadfield plants have been sold throughout the World, and many of these are repeat orders.

● The experience of over 30 years of designing and developing the Broadfield assures the purchaser of the most modern, efficient and low cost superphosphate process and equipment.

Phosphate Acidulating Corporation

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New York 17, N. Y.

FLORIDA

Tennessee Corp.'s U. S. Phosphoric Products division is making studies preliminary to the erection of a multi-million ammonia plant on an eight-acre site adjacent to their present plant in East Tampa.

* * *

Mid-Florida Citrus Cooperative is the new name of the former **Fosgate Citrus Concentrate Cooperative** at Orlando. The new name went into effect June 17. The new mailing address is P. O. Box 2673; there is no change in the telephone number. The firm operates a 20,000 annual ton mixing and ammoniating plant.

* * *

Virginia-Carolina has leased 3,000 acres near Bartow for a 12 year period in a deal reported to run to some $15,000,000. The land was purchased by the lessor, Kentucky Store and Land Co., for $8,000,000. This land will help supply the V-C need for rock reserves, pointed out in February in a letter to the stockholders.

IDAHO

Central Farmers Fertilizer began processing rock phosphate last month in their new electric furnace at Montpelier. Using the TVA process, the plant will turn out about 100,000 annual tons of 55% phosphate, which they report as the highest analysis ever produced commercially. The new plant is the final phase of the $15,000,000 phosphate development by the cooperative. Dedication will take place in September.

ILLINOIS

Unexcelled Chemical Corporation, New York City, has announced acquisition of the net assets of **Aylward Chemical Company** at Sullivan and its affiliates, to be operated as **Aylco Fertilizer Division** of Unexcelled Chemical. Aylco, first business of its kind in the Midwest, was founded by Edwin C. Aylward and is claimed to be the largest manufacturer of complete analysis liquid fertilizers in the U.S., operating four modern plants in Illinois. Marketing arrangements are maintained through some 75 distributors. Mr. Aylward will continue to direct activities of the division, and there will be no changes in personnel or company policy.

MARYLAND

Davison Chemical has installed at Curtis Bay equipment for continuous production of superphosphate at the rate of 100 hourly tons.

The new "Super Flo" installation, designed by A. J. Sackett and Sons Co. of Baltimore, replaces six batch-type units in the largest superphosphate plant under one roof in the world. Economically more efficient, the new equipment also gives a better product.

Among advantages of the product are that it is easier to handle because it is more uniform in texture and practically dust free. Porous grain structure and other physical properties make it an ideal product for use in critical ammoniation and granulation units. Continuous process control with narrow tolerances reduces any tendency to variability in analysis.

Davison supplies the product partly to other manufacturers who use it for producing mixed fertilizers; part goes to the company's own mixing operations, and a part is granulated for direct application to the land.

In the process, ground phosphate rock regulated by weight belt and sulphuric acid measured by magnetic flow meter are delivered to one end of the continuous system and partially cured superphosphate, discharged from the other end, is conveyed to storage.

MINNESOTA

Agrico got under way early last month with construction of their new fertilizer plant at Sleepy Eye. The plant, which is going up on a 64-acre, recently purchased site is slated to have its first construction phase completed by Fall, according to C. N. Powell, president.

MISSOURI

Armour and Company has purchased the nitrogen plant of **Mississippi River Fuel Corporation** near Festus, according to a joint announcement. Armour will require all of the plant personnel. They are proceeding with plans to expand the nitrogen facilities.

The plant produces anhydrous ammonia in the amount of approximately 240 tons per day, part of which is converted into nitric acid which is then processed into various ammonia and ammonium nitrate solutions and granulated ammonium nitrate. Armour expects to expand into the direct application of various nitrogen solutions.

At the same time, William Wood Prince, Armour president, announced formation of the Armour Agricultural Chemical Company, as a division of Armour and Company. It will include the Armour fertilizer, nitrogen and phosphate divisions.

Announcement of the purchase follows the statement made by Mr. Prince to shareholders at the Armour Annual Meeting in February that "We must acquire our own production of anhydrous ammonia. This will enable us to enter the growing fertilizer field of direct application and high analysis fertilizers."

W. E. Shelburne, president of the Armour Agricultural Chemical Company, said that a research and development group will be set up to investigate application of various nitrogen solutions. The Festus plant, opened in 1955, is on the Mississippi river south of St. Louis.

The Armour Agricultural Chemical Company with headquarters in Atlanta, Ga., also operates phosphate mining and processing facilities and fertilizer mixing plants. Mr. Shelburne, a vice president of Armour and Company, has been general manager of the fertilizer division.

* * *

Farmers Chemical has completed a new warehouse, thus rounding out a $140,000 program of supplementary projects.

NEW JERSEY

Dixon Chemical's I. P. Thomas division which, as has been reported here, is marketing a complete line of pesticides under its own "Dixco" label, has completed construction of a conveyor belt system and new bagging facilities at its Paulsboro fertilizer plant.

NORTH DAKOTA

Reynolds Liquid Fertilizer Co., Reynolds, has been incorporated, listing $25,000 capitalization, by Maurice Gjelsness, Henry Larson, Leo

and Alvis Schultz and Joseph Ackerman, all of Reynolds.

OREGON

Pope and Talbot are operating a pilot plant to package ground bark 60% and peat moss 40% mixed with ammonium sulphate and iron sulphate, to be used as a fertilizer.

PENNSYLVANIA

Philadelphia and Reading Corp., jointly with **General Dynamics,** as reported here last month, are planning a $100,000,000 operation near Pottsville to turn into useful chemicals, notably for fertilizer, the millions of tons of coal dust, carbon-covered rocks and stumps and other refuse of coal mining operations. P&R already owns an estimated 300,000,000 tons of this waste. Dynamics-Reading, as the operation is tentatively named, will use the German Lurgi process now used for other purposes in many parts of the world. The operation would call for a power plant, a Lurgi gasification and purification unit, an electric furnace.

TENNESSEE

Davison Chemical is expanding employee conveniences at its Erwin plant. A new service building, lunchroom, showers and other facilities are being added.

TEXAS

Hayes-Sammons Chemical, Mission, have introduced a new spray-fertilizer they call Flo-Tron, for foliar feeding. It can be plane-sprayed when diluted, or applied through a conventional spray rig. It can be mixed with any standard insecticide, the company vice-president, Claborne B. Brazeal, reports.

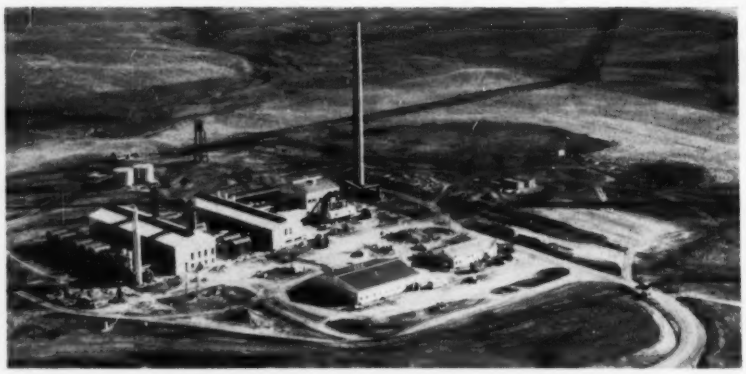
UTAH

Dixon-Western Chemicals are planning a $3,500,000 sulphuric acid plant at Sulphurdale, with a capacity of 500 daily tons. D-W, a joint venture of Dixon Chemical & Research with American Sulphur & Refining, considers this move as the first step in the development of an overall chemical complex.

CANADA

Texas Gulf Sulphur, Devon-Palmer Oils, and **Shell Oil of Canada,** joint owners, report startup of a new sour gas processing and sulphur extraction plant at Okotoks, near Calgary.

Rated capacity of the new installation, which is being operated by Texas Gulf Sulphur, is 370 daily long tons of sulphur. The gas gathering system, sweetening plant and sulphur conversion units are designed to process 30,000,000 cubic feet of sour gas daily.



A sulphur extraction plant, capable of producing 100,000 tons of elemental sulphur annually from "sour" gas, started production June 3 at Okotoks, Alberta, Canada. The facilities are jointly owned by Texas Gulf Sulphur Company and Devon-Palmer Oils, Ltd.

Collected from producing wells in the Okotoks Field, sour gas is being sweetened and dehydrated to produce commercial gas for sale to Canadian Western Natural Gas Company, Ltd. Annual yield of sweet gas will amount to approximately 4,248,400,000 cubic feet, according to officials of the operating companies.

Texas Gulf Sulphur is the leading U. S. producer of sulphur. It operates Frasch (hot-water) process mines at Fannett, Newgulf, Moss Bluff and Spindletop Domes in Texas, and at Nopalapa Dome in Mexico. The Company's experience with gas-recovered sulphur dates from 1941. Its Worland, Wyo. extraction plant pioneered in volume production of recovered sulphur in 1950 and was until recently the largest such plant of its kind in the world. Texas Gulf's production of sulphur in the United States last year amounted to approximately 2,200,000 long tons.

The sulphur extracted from the new Canadian plant will be marketed from the Okotoks area, officials stated. Sulphur storage vats, situated on a tract of land about 100 feet below the level of the plant site, are served by a spur line of Canadian Pacific Railroad.

The new facility, according to officials, aids in the conservation of natural resources, offers a new source of gas for local consumption, and gives to the world additional sulphur production.

EIRE

W. & H. M. Goulding, Ltd. has appointed Simon-Carves as main contractors for the $7,000,000 works at Cork, known as the Marina Works. The operation comprises a sulphur-burning contact-type sulphuric acid plant (the first in Eire) to produce 70,000 annual tons of 100 per cent sulphuric acid; plants to use the acid in the production of the equivalent of 200,000 annual tons of superphosphates as single and triple superphosphates and compound fertilizers, etc., and the associated handling and storage equipment; this new output will be additional to Goulding's present production.

When completed in a year's time, the 18-acre Marina Works will be one of the biggest industrial undertakings in Eire and one of the most modern and economic fertilizer factories in the world. The production is planned to meet both present and anticipated future demand.

ENGLAND

Shell Chemical formally opened their new plant at Shell Haven which has been three years in the building, and has a capacity of 75,000 annual tons of ammonia. Officials state that this is only the first step in the company's intention to expand in this field.

GERMANY

Uinon Rheinische Braunkohlen-Krafgtstoff is expecting to be in production by the middle of next year with an urea plant of 25,000 annual tons capacity near Wesseling.

INDONESIA

Foster-Wheeler, New York, have been awarded a contract by the Indonesia Government to construct near Palemban, Sumatra, a 330 daily short-ton prilled urea plant, completion of which is expected for late 1962. Cost is estimated at $30,000,000, which is to come from the Export-Import Bank.

ISRAEL

Fertilizers & Chemical Ltd., now government owned, will be bought by a group of Americans, who will progressively take over the Govern-

ment interest. Sam Rothburg heads the take-over corporation, which is known as Isreal Investors Corp. Final investment is expected to be about $12,000,000 with the Government guaranteeing an 8% minimum annual dividend.

* * *

Societe Belge de L'Azote et des Produits Chimiques du Marly (SBO) have started up successfully the nitric acid plant they have built for Fertilizers & Chemicals Ltd., using a process which is owned by SBA, used in their own plants and in various other installations.

JAPAN

Mitsubishi is building a pilot plant costing $139,000, to test a new phosphoric acid process developed at the Tohoku University, and which—while very secret—is said to produce at lower cost with simpler equipment.

KOREA

Choongjoo Fertilizer Plant was due to be ready last month for test runs, and tentative plans are for dedication in September if everything goes smoothly meanwhile.

* * *

Najoo Fertilizer Plant, an 85,000 annual ton urea operation, financed entirely by Koreans, is due to be ready for operation in November of next year. It will be large enough to satisfy a third of the current Korean fertilizer needs. There are more than 34,000 shareholders, ranging from small farmers to important industrialists, and shares are held in small lots. Pride of ownership and independence from outside financial aid is manifest in the operation. German technicians will move in around November when construction will be well advanced.

MEXICO

Petroles Mexicanos has announced an expansion program which includes facilities for agricultural chemicals. Basic engineering is in the hands of Universal Oil Products Company, while detailed engineering and procurement will be handled by the Fluor Corporation. Actual construction will be done by Petroleos Mexicanos.

NETHERLANDS

Albatros Zwavelzuur en Chemische Fabrieken N. V. is the joint operation of Netherland's Albatross and the Cyprus Mines Corp. of Los Angeles, USA. Sulphuric acid from pyrites will be the product of the initial unit to be set up at Pernis.

obituaries

Mrs. Charles J. Brand, June 16, wife of NFA's executive secretary, 1925-1945.

J. Burris Dalton, Davison Chemical, died of a heart attack in Baltimore May 13. He had been with Davison for 32 years.

R. Barnwell Fuller, 62, retired from International Minerals & Chemical, at Lakeland, Fla.

Leo Hart Harvey, 60, Dixie Chemical, at Kinston, N. C.

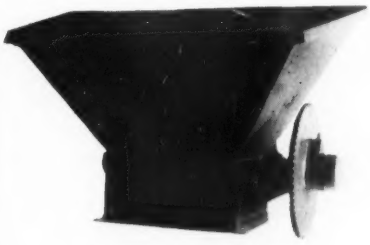
Dr. James H. Hibben, 62, one of the foremost chemical consultants in the US, died June 15 of injuries sustained in a fall at his home, at George Washington University Hospital, Washington, D.C. He was chief of the chemical division of the U.S. Tariff Commission.

Byron Jacobs, Tryco Mfg. Co., April 10 of a heart attack.

Mrs. Raymond L. King, June 21 in Valdosta, Ga.; wife of president and general manager of Georgia Fertilizer Co.

Dr. Ben Nicolet, 69, former USDA senior chemist and past president of the Chemical Society of Washington, May 15, in a Washington, D. C. hospital.

Quality...by Atlanta Utility



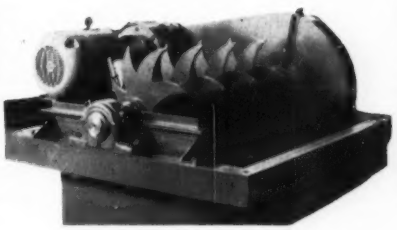
No. 172-F Breaker—24"x30"

BREAKERS

For Primary Size Reduction of Fertilizer Lumps

- Break up large lumps
- Feed elevator more uniformly, eliminate shock loading
- Cut down on material spillage
- Eliminate man at elevator intake breaking lumps and cleaning up
- Can be used with screw or belt feeders

- Increase effective capacity of mill by putting more material through screen the first time, reducing load on tailings mill, reducing oversize "run-around" on elevator and screen
- Heavy construction throughout
- Heavy duty roller bearings
- Shear-pin drive protection against foreign objects
- Hammers face-hardened, easily renewed in field
- "Lift-out" design for service and repair, removal of grating



No. 195-F Breaker—31"x56"
Shown with Intake Hopper Removed

ELEVATOR BOOT BREAKER SIZES:

180-F 13" x 17" Power Required Approx. 5 HP Capacity Approx. 7 tons/hour
183-F 21" x 20" Power Required Approx. 5 HP Capacity Approx. 15 tons/hour
172-F 24" x 30" Power Required Approx. 5 or 7½ HP Approx. 30 tons/hour
189-F 28" x 30" Power Required Approx. 7½ or 10 HP Approx. 45 tons/hour
155-F 31" x 26" Power Required Approx. 10 or 15 HP Approx. 60 tons/hour
195-F 31" x 56" Power Required Approx. 20 HP or more Approx. 100 tons/hour

CONTINUOUS AMMONIATORS—GRANULATORS—BATCH MIXERS
BREAKERS — PULVERIZERS — CAGE MILLS — BELT CONVEYORS
BAGGED GOODS CONVEYORS — REVOLVING & VIBRATING SCREENS
COMPLETE MIXING UNITS — SHIPPING UNITS
MATERIALS ASSEMBLY HOPPER UNITS — HOPPER SCALES
BROADFIELD CONTINUOUS SUPERPHOSPHATE UNITS

ATLANTA UTILITY WORKS

Manufacturers and Engineers for 61 Years

EAST POINT, GEORGIA

THE NITROGEN LOSS PROBLEM

The nitrogen loss problem . . . which costs the fertilizer industry millions of dollars annually . . . was one of the topics which stirred up intense interest at the Tennessee Valley Authority Division of Chemical Development's pilot-plant demonstration of new processes June 9-11 at Muscle Shoals, Ala. Travis P. Hignett, chief of the Applied Research Branch, introduced the topic and Alvin B. Phillips, chief of the Process Engineering Branch, described some of the experimental work on the problem. This paper comes direct from the proceedings of the meeting.

After several large-scale continuous ammoniators were in operation, reports began to come in that heavy fuming and high nitrogen losses were encountered in many cases. This was surprising to us for we had not encountered this problem.

The probable cause of this new problem is the lack of any suitable criterion for scaling up the pilot-plant data. Most equipment manufacturers assumed that the capacity of an ammoniator was proportional to its volume. We cannot criticize them for this since we had no better formula to offer.

A 6- by 6-foot ammoniator has eight times the volume of our 3- by 3-foot pilot-plant unit. Since the pilot plant operated satisfactorily at 3 tons per hour, the 6- by 6-foot unit was expected to handle 24 tons per hour. The reaction, however, occurs not throughout the entire volume of the ammoniator, but in the immediate vicinity of the spargers. The length of the spargers of the 6- by 6-foot unit is only about twice the pilot-plant spargers, although they must deliver eight times as much ammonia and acid. Therefore, for each foot of sparger length, four times as much chemical reaction occurs. This can cause local overheating, overgranulation, mud formation, and attendant fuming and nitrogen loss.

A typical pilot-plant acid sparger has an active length of 15 inches with twenty holes spaced ¾ inch apart. When the pilot plant is operated at 3 tons per hour on a formulation using 140 pounds of acid per ton, the amount of acid discharged through each hole is 21 pounds or 1.4 gallons per hour. In large-scale ammoniators the sparger length is increased, but sometimes the spacing of the holes is also increased so that there may be no more holes than in the pilot-plant unit. So we may have as much as 168 pounds or 11 gallons per hour through each hole. This can cause localized spots of high acidity which can cause serious nitrogen loss.

To obtain some idea of the extent of the nitrogen loss problem, all available reports of state laboratory analyses of fertilizer samples were collected and examined. Averages of thousands of samples showed that the nitrogen content of 10-10-10 and 12-12-12 was consistently low. For instance, in a typical state the average analysis of 12-12-12 was 11.5-12.5-12.5. About half of the samples were deficient in nitrogen to an extent that exceeded the tolerance set by the state law.

We have been assured by many manufacturers that the nitrogen input is at least equal to that guaranteed, usually appreciably more than guaranteed. If we assume that the average manufacturer formulates 12-12-12 to contain the same amount of nitrogen, P_2O_5, and K_2O and comes out with 11.5-12.5-12.5, then a full unit of nitrogen must have been lost. If the P_2O_5 and K_2O contents were formulated to be exactly 12 per cent, we must assume that there has been an unanticipated weight loss of about 80 pounds to account for the overage of these elements. It seems evident that the nitrogen loss is not primarily ammonia since ammonia loss would not cause so much weight loss.

The heavy nitrogen loss is an economic loss in several ways: the actual value of the nitrogen lost, the shrinkage in weight of the product, the overage in P_2O_5 and K_2O for which the manufacturer does not get credit, and the penalties and unfavorable publicity due to deficiencies found by state laboratories. These economic losses have been estimated to amount to several million dollars per year.

Studies of Loss of Nitrogen in 12-12-12

During much of the previous pilot-plant work on the continuous ammoniation process, primary emphasis was placed on the development of workable formulations for most of the popular grades. One of the requirements of a workable formulation was that it should not result in excessive loss of free ammonia. A loss of more than 5 per cent of the free ammonia in the formulation, as determined by analysis of the ammoniator exhaust gas, was considered excessive. Occasionally, tests were made in which the ammoniator exhaust gases were analyzed for other nitrogen compounds such as ammonium chloride and soluble oxides of nitrogen. These did not disclose important losses other than the loss of free ammonia. Nitrogen losses determined by material balance occasionally failed to correlate well with the ammonia loss; however, these discrepancies were generally attributed to factors such as segregation, difficulty in sampling, and the short duration of the runs which tended to make the balances less accurate than the gas analysis.

With the increasing number of reports of failure in the commercial units to make grade with respect to nitrogen, it bacame obvious that losses of nitrogen not detected in the pilot-plant work were involved. Consequently, a series of special tests was made to obtain further information on the loss of nitrogen. The 12-12-12 grade was chosen for this work because, of the more popular grades, it is the one in which highest nitrogen losses are reported. The formulation used was the standard one used in the majority of plants. It contained 9 units of nitrogen from solution and 3 units from ammonium sulfate. Other materials were ordinary and triple superphosphate, potassium chloride, and sulfuric acid. Following is a discussion of some of the data ob-

Production rate* tons/hr./ft. of ammonia distributor	Hourly rate of production of 12-12-12	Length of distributor, inches For acid	For solution
0.8	2	15	30
1.2	3	15	30
1.6	2	7.5	15
2.4	3	7.5	15

*Rate per foot of acid distributor is twice these values.

tained in the tests.

Effect of Acid Feed Rate

In pilot-plant production of 12-12-12 grade at a 2-ton-per-hour rate the amount of sulfuric acid used in the formulation was varied from 75 to 225 pounds per ton of product to study the effect of the acid rate on loss of nitrogen as determined by ammoniator exit gas analysis for ammonia. Ammoniating solution and sulfuric acid were fed through the 30- and 15-inch distributors, respectively. In carrying the acid feed rate, the degree of ammoniation of the superphosphates in the formulation was varied from about 40 to 140 per cent of the normal value (3.8 and 5.8 lb. ammonia/unit of available P_2O_5 for triple and ordinary superphosphate, respectively).

Data showing the effect of acid rate on loss of nitrogen as ammonia in the ammoniator are plotted in Figure 3. The degree of ammoniation also is shown for the various acid rates. Figure 3 shows that the lowest loss (0.7%) was obtained at about 75 per cent of the normal degree of ammoniation (170 lb. sulfuric acid/ton). The loss increased at about equal rates as the degree of ammoniation increased or decreased from the 75 per cent value. At a degree of ammoniation of 40 per cent the loss was 2.7 per cent. At a degree of ammoniation of 110 per cent the loss was 2.4 per cent, and at 140 per cent of normal ammoniation the loss increased to 5.2 per cent. It is believed that at the low degrees of ammoniation the high acid rates caused the increasing losses by raising the temperature of the material and by promoting overagglomeration. Nitrogen losses other than ammonia undoubtedly occurred in these tests, but their measurement was not sufficiently reliable to permit correlation with the acid rate.

We do not wish to infer that these pilot-plant results can be applied directly to large-scale plants, The conditions for minimum nitrogen loss undoubtedly will vary depending on plant equipment, method of operation, and formulations used. However, in large units it is likely that ammonia loss will be increased by increased acid rates at some level of acid addition.

Effect of Production Rate per Unit Length of Distributor

It was considered likely that the higher production rate per unit length of ammonia distributor in the large-scale continuous ammoniators might be a cause for at least part of the higher loss of nitrogen reported in large-scale production. Pilot-plant tests were made, therefore, to determine the effect of the production rate per foot of distributor on loss of nitrogen in the ammoniator. The hourly production rate of 12-12-12 and length of distributors were varied to give values of 0.8, 1.2, 1.6, and 2.4 tons per hour per foot of ammoniator distributor. The highest rate is about the same as is commonly used in some large-scale ammoniators for these grades, although higher rates are often encountered. The variations in production rate per unit of distributor length were obtained in the pilot plant by the following combinations of production rate and lengths of distributors.

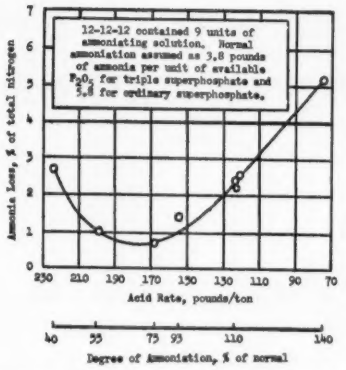

12-12-12 contained 9 units of ammoniating solution. Normal ammoniation assumed as 3.8 pounds of ammonia per unit of available P_2O_5 for triple superphosphate and 5.8 for ordinary superphosphate.
Ammonia loss, % of total nitrogen
Acid Rate, pounds/ton
Degree of Ammoniation, % of normal

Figure 3. Effect of Acid Rate on Loss of Ammonia in Production of Granular 12-12-12

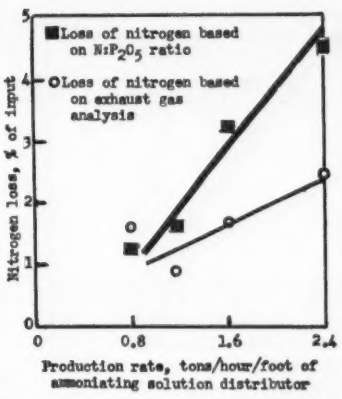

Loss of nitrogen based on N:P_2O_5 ratio
Loss of nitrogen based on exhaust gas analysis
Nitrogen loss, % of input
Production rate, tons/hour/foot of ammoniating solution distributor

Figure 4. Effect of Production Rate on Loss of Nitrogen

In making these tests, special precautions were taken to proportion the ingredients and to obtain representative product samples so that the nitrogen loss could be determined accurately by comparison of the input and output N:P_2O_5 ratios, as well as by gas analysis.

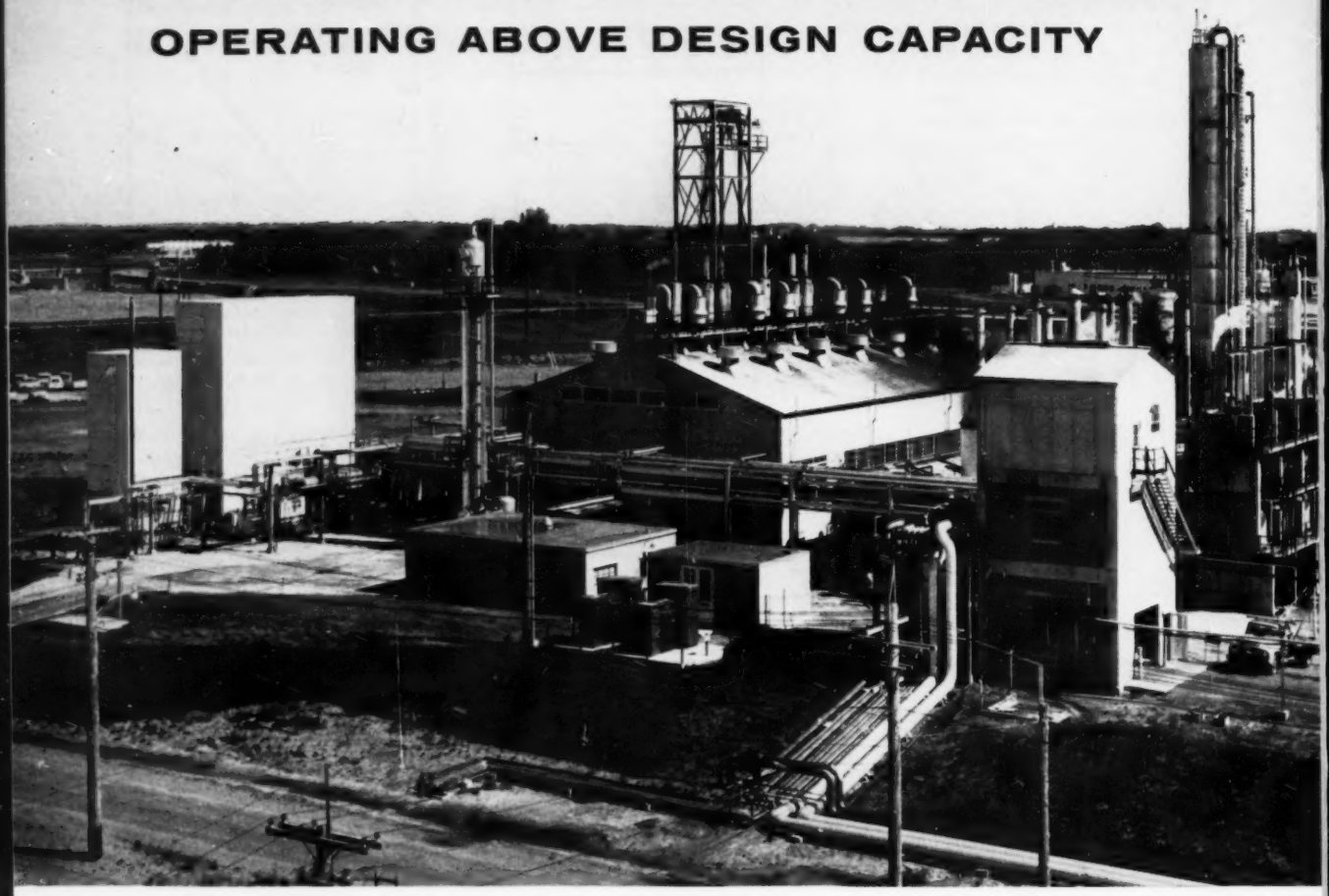
Data showing the effect of rate of production per foot of distributor on loss of nitrogen as indicated by gas analysis and by N:P_2O_5 weight ratios of feed materials and ammoniator product are given in Table I. Figure 4 shows a plot of the

TABLE 1. Effect of Production Rate per foot of Distributor on Loss of Nitrogen

Production rate of 12-12-12, tons/hr./ft. of ammonia distributor	Ammoniation rate*, % of normal	Ammoniator product temperature, °F.	Nitrogen loss as determined by Gas analysis	Nitrogen loss as determined by N:P_2O_5
0.8	93	211	1.4	0.4
	93	211	1.5	0.6
	75	228	0.7	0.6
	92	210	0.9	0.8
	110	206	2.2	1.8
	111	206	2.4	1.9
	113	191	1.8	2.9
Average			1.6	1.3
1.2	92	—	0.9	1.9
	93	—	0.8	1.2
	94	—	0.9	1.7
Average			0.9	1.6
1.6	59	225	1.5	4.1
	93	210	0.9	2.5
	95	212	1.2	0.7
	98	202	3.3	6.0
Average			1.7	3.3
2.4	100	212	2.3	4.9
	118	193	2.7	4.1
Average			2.5	4.5

*Normal ammoniation rate: 3.8 and 5.8 pounds per unit of P_2O_5 from triple and ordinary superphosphate, respectively.

ST. PAUL AMMONIA PRODUCTS, INC. PLANT OPERATING ABOVE DESIGN CAPACITY



Ammonia Plant—Designed, Engineered and Constructed by Lummus—Feeds Natural Gas or Butane

The St. Paul Ammonia Products, Inc. plant at Pine Bend, Minnesota has been operating continuously at rates above the design capacity of 200 tons per day of ammonia. Lummus' policy of close cooperation with the client at every stage was followed at St. Paul Ammonia. Lummus' extensive experience in plant design and construction have been effectively combined with the experience in plant operation of St. Paul Ammonia's capable staff in order to achieve a successful project.

In addition to producing anhydrous ammonia and ammonium nitrate solutions for the fertilizer industry, St. Paul also produces anhydrous ammonia meeting industrial specifications.

The Texaco Synthesis Gas Generation Process is employed to produce hydrogen for ammonia synthesis. Natural gas direct from the pipeline is normally used as the raw material. However, during the cold Minnesota winters the supply of natural gas is subject to interruption when preference is given to household users. The plant is designed so that at these times butane is used as the raw material.

The large compressors are gas-engine driven and use natural gas fuel except during the winter months, when propane from storage tanks is employed. The Lummus design fits the plant to the needs of the area and permits this sort of flexible operation.

This plant utilizes a hot potassium carbonate system for removal of CO_2, which helps reduce production costs.

Lummus acted as general contractors for the entire project which includes ammonia synthesis, nitric acid, and ammonium nitrate solutions units, and offsite facilities including utilities, tankage and product shipping.

Lummus has experience in design and operation of ammonia plants utilizing natural gas, heavy fuel oil, butane, and waste chlorine cell hydrogen. Capacities of Lummus built ammonia plants range from 60 to 300 tons per day.

In the past 50 years, Lummus has built over 800 plants to produce petrochemicals, chemicals and petroleum products. If your company is planning facilities of this kind, discuss your plans with Lummus.

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losses determined by both methods. Several interesting things are indicated by these data. The loss of nitrogen as determined by chemical analysis of solutions used to scrub samples of exit gas from the ammoniator (gas analysis) appeared to increase slightly with increased rate per foot of distributor. The loss as determined by $N:P_2O_5$ ratios in the feed materials and in the product increased steadily from 1.3 to 4.5 per cent as the unit production rate was increased from 0.8 to 2.4 At the higher rates the loss by $N:P_2O_5$ ratio was about twice as great as by gas analysis. This trend had been noticed before in data for other pilot-plant tests.

Laboratory-Scale Studies in Decomposition of Ammonium Nitrate

The most plausible explanation of loss of nitrogen in a form that would not be detected by scrubbing samples of exhaust gas was the decomposition of ammonium nitrate to nitrous oxide or elemental nitrogen. It is reported in the literature* that, in the temperature range 410° to 500° F., 98 per cent of the decomposition of dry ammonium nitrate is decomposed according to the following equation.

$$NH_4NO_3 \longrightarrow N_2O + 2H_2O$$

Elemental nitrogen also is formed. Ammonium nitrate that contains both chlorides and free nitric acid is reported to undergo serious decomposition upon heating to 295° F. Chlorides also increase the proportion of elemental nitrogen in the products. Consequently, small-scale tests were undertaken to study factors that might cause decomposition of ammonium nitrate under conditions that might prevail in the ammoniators and, if possible, to collect and identify the compounds that make up the unaccountable loss of nitrogen

Mixtures containing ammonium nitrate were heated in ovens for about an hour, and the loss of nitrogen was determined by analysis of the residue. Exploratory tests indicated that little or no decomposition of ammonium nitrate occurred unless acid or potassium chloride was present. Therefore, sulfuric acid and potassium chloride were usually included in the mixtures used to investigate the effect of acid concentration and temperature on loss of nitrogen.

*Saunders, H. L. **J. Am. Chem. Soc. 121**, 698-711 (1922).

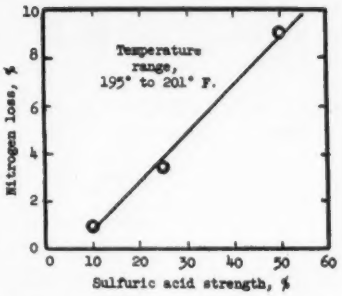


Figure 5. Effect of Sulfuric Acid Concentration on Decomposition of Ammonium Nitrate

The effect of varying the acid concentration in the presence of potassium chloride is shown in Figure 5. When a mixture consisting of 40 per cent ammonium nitrate, 40 per cent potassium chloride, and 20 per cent diluted sulfuric acid was heated to about 200° F., the loss of nitrogen increased from 1 to 9 per cent as the acid concentration was increased from 10 to 50 per cent. The effect of the temperature to which the mixture was heated on loss of nitrogen when using 50 per cent sulfuric acid in the above mixture is shown in Figure 6. Time of the maximum temperature during the hour of heating varied from 12 to 20 minutes. The loss increased from 10 per cent at 195° F. to about 30 per cent at 245° F.

In these tests, less than 5 per cent of the nitrogen evolved was found in an absorption train designed to collect ammonia, ammonium salts, NO, NO_2, and nitric acid. This lent support to the postulate that the

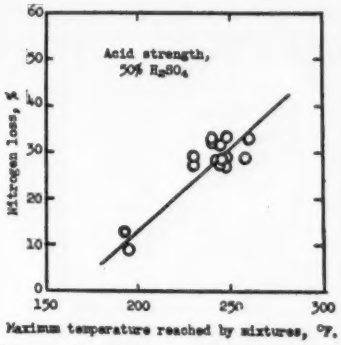


Figure 6. Effect of Temperature on Decomposition of Ammonium Nitrate

decomposition resulted in the formation of nitrous oxide (N_2O).

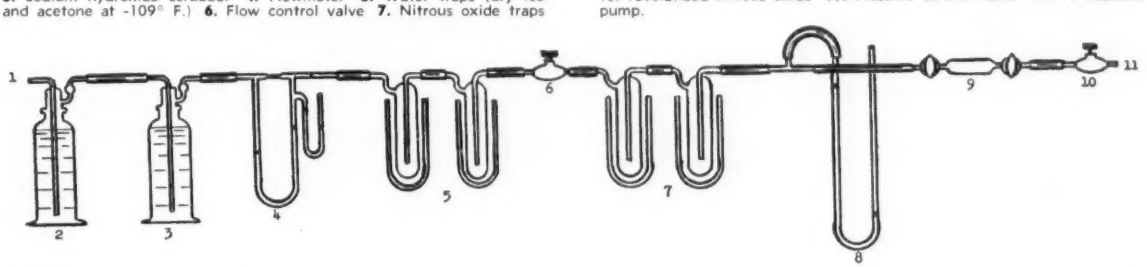
A sketch of the equipment developed for the detection of nitrous oxide in effluent from the tests is shown in Figure 7. The effluent gases are passed through scrubbers containing acid and basic solutions to remove soluble nitrogen compounds and a dry-ice-cooled trap to remove water. Nitrous oxide is removed by cooling below its freezing point under vacuum using liquid nitrogen as the coolant. The nitrous oxide thus collected is revaporized and its volume measured. Also, samples of the revaporized material are analyzed.

When this equipment was used to collect the effluent gas from the laboratory tests described above, as much as 85 per cent of the nitrogen loss could be accounted for. About 4 per cent of that evolved was collected in the scrubbers in the form of soluble nitrogen compounds, and up to 81 per cent was recovered as nitrous oxide.

To date, only a few samples of gas from the pilot-plant runs have been checked for nitrous oxide. When high production rates per unit of distributor length were used, the nitrous oxide detected amounted to about 20 per cent of the total nitrogen represented by nitrogen compounds detected in the samples. While the amounts collected do not

Figure 7. Apparatus for Recovering Decomposition Products of Ammonium Nitrate

1. Gas inlet **2.** Sulfuric acid - potassium permanganate scrubber **3.** Sodium hydroxide scrubber **4.** Flowmeter **5.** Water traps (dry ice and acetone at -109° F.) **6.** Flow control valve **7.** Nitrous oxide traps (liquid nitrogen at -320° F.) **8.** Pressure indicator **9.** Measuring bulb for revolatized nitrous oxide **10.** Pressure control valve **11.** To vacuum pump.



account for all of the hitherto unexplained nitrogen loss, it appears that a substantial portion of the loss involves the decomposition of ammonium nitrate. Further efforts are being made to make the method of detecting nitrous oxide in the pilot-plant gas more quantitative. This work will then be extended to include measurements of decomposition in the dryer.

Conclusions and Recommendations

We believe that the results of our pilot-plant tests on the nitrogen loss problem show that nitrogen is lost from the continuous ammoniator both as free ammonia and in substantial quantities as the decomposition products of ammonium nitrate. The decomposition products contain nitrous oxide and possibly elemental nitrogen and cannot be detected by ordinary gas analysis.

The loss of nitrogen as free ammonia occurs in increasing amounts when the degree of ammoniation is increased much above 5.8 pounds per unit of P_2O_5 from ordinary superphosphate and 3.8 pounds per unit from triple superphosphate. The use of large amounts of sulfuric acid to reduce the degree of ammoniation considerably below these rates is not an effective way to prevent loss of free ammonia.

Our pilot-plant tests show an increase in the loss of free ammonia when the degree of ammoniation was decreased below 75 per cent of its normal value by the addition of acid. This is due presumably to the high temperatures developed and excess agglomeration which made ammoniation less efficient. The adverse effect of increasing acid rates is likely to be accentuated in large-scale units where good distribution of liquids is more difficult than it is in the pilot-plant ammoniator. A more effective way to reduce the loss of free ammonia would be to lower the free ammonia content of the formulation.

We believe that conditions favoring serious loss of nitrogen by decomposition of ammonium nitrate are likely to occur in many large-scale ammoniators. Localized areas of high temperatures or high acidity, or both, may result when distribution and mixing of the liquids with the solids are poor or when too much reaction occurs per unit length of distributor. These conditions may not be detectable by measurements made on the ammoniator product. Temperature near the distributors in the pilot-plant ammoniator during production of 12-12-12 has been found to be as high as 260° F., about 30° F. higher than the product temperature. It seems safe to assume that higher localized temperatures are encountered in large-scale units where there is less surface available for heat loss and good distribution is difficult to maintain.

In order to reduce the loss of nitrogen caused by decomposition of ammonium nitrate when making high-nitrogen grades such as 12-12-12, we suggest the following precautions.

1. Use distributors that extend throughout the full length of the ammoniator.
2. Use distributors designed to give maximum distribution of liquids. Distributors should be slotted or should contain a large number of small holes rather than a few large ones.
3. Distributor and supporting members should be of streamlined design to minimize interference with the rolling action of the bed.
4. Formulations and operating conditions should be adjusted to avoid overgranulation to the extent that mixing would be impaired.
5. Distributors should be inspected and cleaned frequently. They should be replaced before the openings are enlarged to the extent that the distribution pattern is changed. The acid distributor requires particular attention as it is subject to the worst corrosion. Hastelloy C is a recommended material for acid distributors.
6. Formulations giving excessive heat of reaction should be avoided.

We believe that, for new installations, the cost of building longer ammoniators than are in common use would be money well spent. Some of the existing ammoniators may be so short that even with full-length distributors the concentration of heat of reaction is too great. In such cases it may be profitable to install a second set of distributors to utilize the volume of the ammoniator effectively. Another variation that might serve to reduce localized overheating is separation of the solution and acid distributors a short distance in order to permit mixing of the solution with the solids before it reacts with the acid. These variations will be tested in the pilot plant, but tests made in large-scale equipment would be more conclusive.

Description of Demonstration Run

In the demonstration run, conditions conducive to high loss of nitrogen will be used. The production rate will be 3 tons an hour. Ammoniating solution will be introduced through a short distributor (15 in.) extending only half way the length of the ammoniator. The acid will be distributed through a pipe 7.5 inches long, drilled, and containing five 7/32-inch holes. Under these conditions the production rate per unit length of distributor will be relatively high (2.4 tons/hr./ft.), and distribution of acid should be poor. The temperature near the acid distributor and the temperature of the material leaving the ammoniator will be recorded continuously to illustrate the excessive temperature in the hot zone.

The sampling apparatus for detecting nitrous oxide will be in operation in the pilot-plant area, and recovery of nitrous oxide can be observed. This material is trapped as a white solid at a temperature of about minus 320° F.

The formulation to be used in the pilot-plant run follows:

Raw material	Analysis	Pounds per ton of product
Ammoniating solution*	41% N	460
Ammonium sulfate	20.7% N	293
Ordinary superphosphate	20% P_2O_5	515
Concentrated superphosphate	46% P_2O_5	301
Potassium chloride	62% K_2O	387
Sulfuric acid	93% H_2SO_4	177

*Composition of solution: 22.2 per cent ammonia, 65 per cent ammonium nitrate, and 12.8 per cent water.

Kentucky Conference

The annual Kentucky fertilizer conference will be held in the Guignol Theater, University of Kentucky, Lexington, July 29. G. T. Webster head of the Department of Agronomy will preside, while Bruce Poundstone, head of the Feed and Fertilizer Department will conduct the business meeting.

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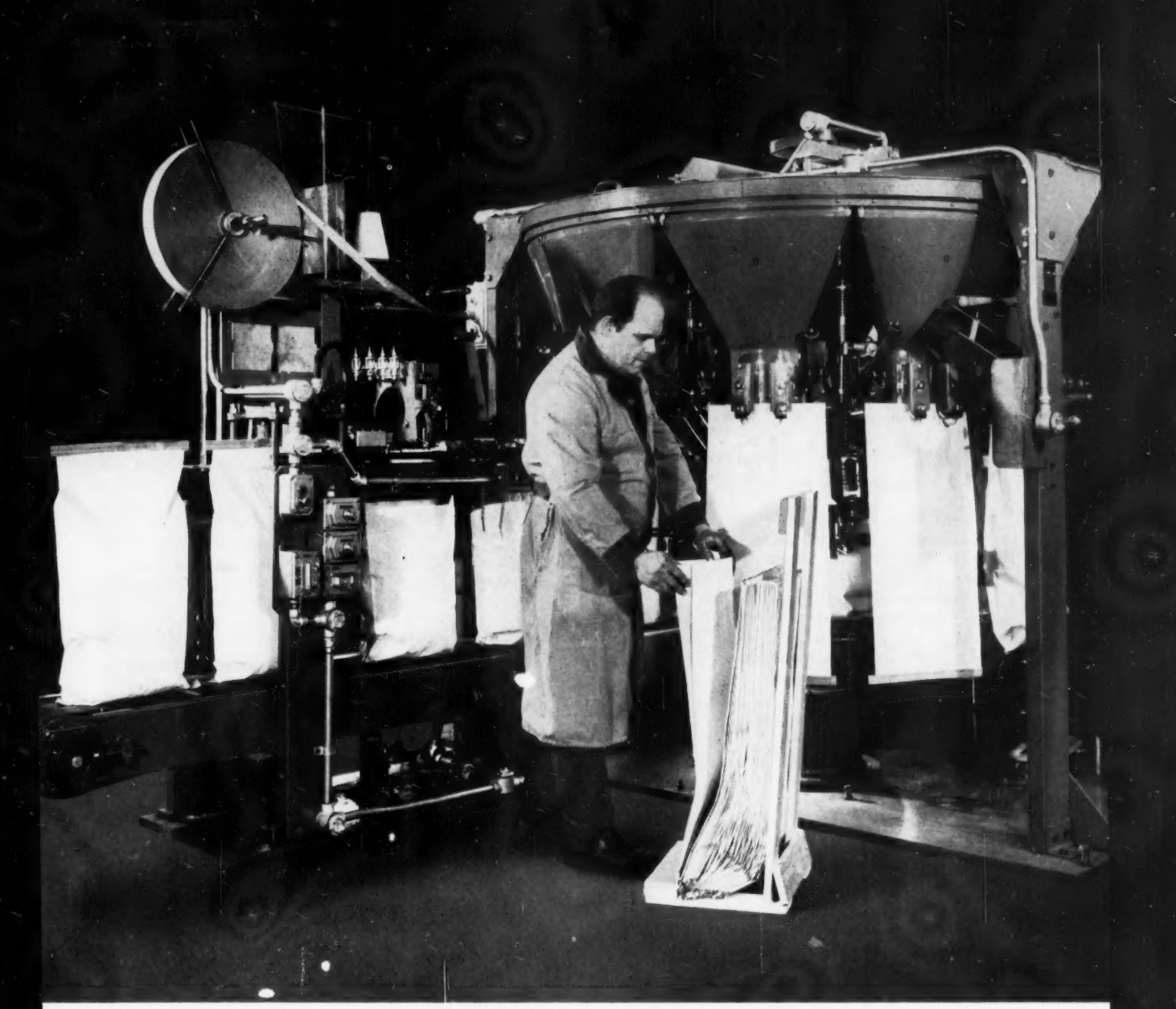

Famous Model "AF" Bagpaker® weighs, fills, settles and closes a 100-lb. bag every 2½ seconds!

With this engineering marvel at his command, the *one man* in our picture can package from 15 to 25 BPM. And he can *instantly* adjust the rate of speed through the machine's variable drive.

The operator simply hangs empty multiwalls on the hopper spouts as the 10-station turret rotates past him. The Model AF Bagpaker takes over from there.

It accurately *weighs* any free-flowing or semi-free-flowing material, quickly *fills* the bag, *settles* it by vibration, automatically *preforms* the top, and *stitches* it tight. You can choose from nine different closures. Bagpak's exclusive "Cushion Stitch," a reinforced two-thread double-lock chain stitch, is standard equipment.

The Model AF Bagpaker is ruggedly constructed of heavy welded steel throughout. Gears are fully enclosed and bathed in oil. Critical parts are of *stainless steel.*

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Bagpak Division **INTERNATIONAL PAPER** New York 17, N. Y.

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IMC Celebrates 50 Years

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The emblem is symbolic of IMC's role as a miner and processor of ores vital to growth of animal and plant life. It incorporates a six-sided form representing the crystalline structure of minerals with a "tree of life" design in the center, the whole depicting minerals and the life-giving qualities locked within them.

The total combination carries out the "minerals for growth" concept that is fundamental to IMC's business . . . mineral resources from which mining and processing skills draw the life-giving qualities to grow food and fiber for the world.

Incorporated in New York June 14, 1909, the company was originally called International Agricultural Corporation. Starting with sales of $5 million annually, it has grown to a nation-wide corporation with 68 mines and plants and annual sales of more than $100 million.

Greatest growth period has come under the direction of Louis Ware, who assumed the presidency in 1939. He envisioned the world-wide corporation IMC was to become, and to that end moved corporate headquarters from New York City to Chicago in 1941.

Its midwest headquarters put IMC in better position to coordinate its nationwide network of mines, plants, and markets. Today headquarters are in Skokie, Ill., Chicago suburb, in an award-winning center only a few minutes from Chicago's jet airport. From this location it serves customers all over the world.

Louis Ware, who became president of IMC in 1939 and chairman of the board in 1958, has directed the company in its greatest period of expansion and diversification.

Another major growth step instigated by Mr. Ware was a diversification program which included the addition in 1942 of the Amino Products Division, maker of Ac'cent, the food flavor enhancer, and in 1951 of the Industrial Minerals Division.

Indeed, the expansion and diversification from the old agricultural company was so significant that in 1942 the name was changed to its present "International Minerals & Chemical Corporation."

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Thomas M. Ware, who succeeded to the presidency in 1958 when Louis Ware became chairman, noted in an anniversary statement the challenge and the opportunity presented by a climbing world population, coupled with growing demand for economic advancement and a better standard of living.

"Most of IMC's products are basic to man's every day needs," he said, "and I am confident the Corporation now has the raw materials, plants, technical skills, and sales capabilities to accomplish such a task and to continue our growth story as we move into our second half century."

International Minerals & Chemical Corporation's headquarters today is the Administrative and Research Center in Skokie, Ill., Chicago suburb. The Center, completed in 1958 has won several awards for excellence in architecture and efficient use of space.

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Fire Ants In News Again

C. C. Fancher, supervisor of the southern region of the plant pest control division, USDA has released results of a poll of Alabama farmers who have had their land treated for fire ants.

Conducted by the Alabama Farm Bureau, some 1,020 questionaires were distributed in 26 counties. Only 805 returned these forms but this group represents 318,093 acres of the 346,931 being treated.

All but one farmer returning the forms, said they believed the program to be of sufficient value to be continued. The lone dissenter answered with a question mark.

The survey reveals 785 farmers believe the fire ant to be detrimental to farming operations and 770 said the treatment cleared up the infestations. Only 9 reported any damage to domestic animals while 789 said there was none. Sixteen reported damage to wildlife compared to 783 who said they had not seen nor heard of any.

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Nov. 9-11	California Fertilizer Association	Fairmont Hotel	San Francisco, Calif.
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A Big Market
THE NATION'S ROADSIDES

Sturdy turf—to help protect the nation's roadsides from erosion and engineering damage—is one of the foremost needs in the present Federal Highway Program, a sub-committee of the American Road Builders Association recently stated.

W. H. Daniel, member of the sub-committee and Purdue University turf specialist, says, "The cost of repairing any washout or failure, even after one heavy rain, may exceed the original establishment cost. Since roadside planting may vary from one to five per cent of the total cost in highway construction, the need for strong, sturdy turf to prevent early erosion and engineering damage is obvious."

To get such a turf, the Sub-committee on Fertilizers and Mulch of the Committee on Roadside Construction and Maintenance of the Road Builders Association suggests six basic principles for roadside fertilization:

1—Maximum fertilization is needed to produce good roadside turf quickly, then it must serve as long-term cover. Topsoil, unless stockpiled and respread, is seldom present on the final graded surface. Because scrapping, hauling, stockpiling, and respreading topsoil is quite costly, repeated applications of a **balanced** fertilizer is much more economical toward maintaining a sturdy, non-washing turf.

2.—Be sure to provide an adequate supply of nutrients for even the **least fertile** soil in the state, county, or soil group where construction occurs.

3.—Nearly all soils need added nitrogen for desired grass establishment. Nitrogen encourages fast growth, dark color, leafy growth, and a dense ground cover.

4.—Whenever phosphate is deficient it is most needed mixed into the root zone before planting. Young plants need phosphorus to develop new cells and make rapid growth. Roots expand rapidly only into soil areas having above minimum phosphorus.

5.—Keep potassium content up. It is used in large quantities as a balancing and regulating element in plants. Also it is leached and fixed gradually in the soil, so potassium needs to be supplied regularly.

6.—As suggested standard, the sub-committee recommends a seedbed application of 100 lbs. each of nitrogen, phosphorus, and potash per acre.

7.—Get a soil test before liming.

To allow for adversity, the sub-committee suggests mulch to protect the investment in seeding, grading, and fertilizing. Mulching means quicker, more uniform turf establishment. It also helps reduce freezing and thawing. And the use of mulch requires and permits much heavier use of fertilization with safety.

The complete report of the sub-committee, edited by Dr. W. H. Daniel of Purdue, can be secured through Better Crops reprint A-1-59, News Service, American Potash Institute, 1102 16th Street, N. W., Washington 6, D. C.

A Renneburg Continuous Combination Ammoniator-Granulator, a Renneburg DehydrO-Mat Dryer with special refractoryless gas-fired furnace, and a Renneburg Straight Shell Cooler . . . being installed in a 30-ton-per-hour granular plant of one of the leading mid-western fertilizer producers.

RENNEBURG CONTINUOUS COMBINATION AMMONIATOR-GRANULATOR

This rugged and highly-versatile unit is being used for government research work and experimentation in plant size quantities.

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Give Your Plants A Shot Of Alcohol

From London comes word that a good stiff drink may be exactly what the agronomist ordered for your sick seedlings. It seems that algae and seedlings have had growth stimulated by alcohol, and now they say that germinating seedlings can also be pepped up by the Demon Rum.

HELP 4-H CLUBS

Bennett and Gidney Ask

Members of the fertilizer industry will have an opportunity to assist the nation-wide 4-H Club movement, according to R. E. Bennett, president of Farm Fertilizers, Inc., of Omaha, Nebraska, and Dean R. Gidney, vice president of the United States Potash Company of New York City.

Bennett and Gidney are co-chairmen of a special fund raising program which got underway June 1 in behalf of the National 4-H Club Foundation.

More than 2,200,000 boys and girls are now members of 4-H Clubs in 50 states and Puerto Rico. Crop and other agricultural 4-H projects this year will utilize more than a million acres of farm land.

In a letter to members of the fertilizer industry, Bennett and Gidney stated, "there is no better investment than in the youth of our country. The youth in whom we will be investigating will be the farm leaders of tomorrow. These young people . . learn by doing to use the latest scientific practices with their soil conservation and crop projects."

The National 4-H Club Foundation is a non-profit educational institution set up in 1948 to assist the Cooperative Extension Service and its youth program. The Foundation is currently carrying out a people-to-people exchange of rural young people between the United States and nearly 50 countries of the free world in the International Farm Youth Exchange program. It provides consultant services to youth leaders in human relations and human development.

Hudson To Display Multiwalls At Moscow

Hudson Pulp & Paper Corp.'s multiwall shipping containers will be part of the American National Exhibition to be held in Sokolniki Park, Moscow, this summer. The Exhibition, sponsored by the Department of State is part of an American-Soviet cultural exchange with which American private enterprise is cooperating.

Chosen as an example of U.S. packaging know-how, Hudson has provided, in addition, a variety of specialty bags and sacks used in retail, produce and industrial packaging. Among the products is Hudson's new "side handle" Multiwall bag which can be carried like a suitcase, and is gaining wide use in packaging of fertilizer and other materials.

The six week pageant of American life starts July 25.

Equipment Leasing Plan Offered

Another industry first for Simonsen Manufacturing Company of Quimby, Iowa, is the firm's new financing and leasing program now available to feed and fertilizer dealers.

The full line of modern Simonsen equipment—including feed delivery bodies of several styles, fertilizer spreaders and fertilizer mixer spreaders—is available on a lease arrangement.

The Simonsen plan allows a dealer to predetermine his equipment costs for budgeting purposes—with all charges taken care of in one check per month. All such charges are tax deductible—another advantage of leasing.

For the full story of the Simonsen finance and leasing plan, write to Simonsen Manufacturing Company, Quimby, Iowa.

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HELP WANTED

WANTED SALES EXECUTIVE

Responsible sales position. Challenging opportunity for imaginative, aggressive agri-chemical graduate with experience in chemical sales. Position involves administration and sales with a progressive, fast-growing midwest manufacturer of liquid fertilizer, insecticides, and herbicides. Mail resume in strict confidence to Box # 22, % Commercial Fertilizer and Plant Food Industry, 75 Third St. N. W., Atlanta 8, Ga.

WANTED: Assistant plant manager for complete fertilizer plant located in southeast. Technical background in chemistry or engineering preferred. Box 24, % Commercial Fertilizer, 75 - 3rd St., N. W., Atlanta, 8, Georgia.

SALESMEN to handle a side line of Dust Masks, Goggles, First Aid Kits, on an exclusive basis. Old Established house. Write advising territory covered. General Scientific Equipment Co., Philadelphia 50, Pa.

WANTED: Experienced Acid Maker to operate and maintain Sulphuric Acid plant. Reply Box 23, % Commercial Fertilizer, 75 Third St., N. W., Atlanta 8, Ga.

PLANTS FOR SALE

FOR SALE: Part interest in progressive, well-established fertilizer plant in business for past 12 years. In rich farming section of North Mississippi. Owner wishes to semi-retire and take in younger man as partner. Write Box # 21, % Commercial Fertilizer, 75 Third St. N. W., Atlanta 8, Ga.

FOR SALE—Complete dry fertilizer mixing plant including automatic batcher 25-30 tons per hour. Good condition. Box # 17, % Commercial Fertilizer, 75 - 3rd St., N. W. Atlanta 8, Ga.

FOR SALE—Complete dry fertilizer mixing plant 10 tons per hour. Good condition. Box # 18, % Commercial Fertilizer, 75 - 3rd St., N. W. Atlanta 8, Georgia.

USED EQUIPMENT FOR SALE

CLOSE-OUT OF USED EQUIPMENT: Troughing Idler, Flight, Bag, Package and Portable Conveyors; Crushers, Vibrating Screens, Feeders, Bins, Motors, and other equipment. All rebuilt and guaranteed. Write for free Catalog and price list. Bonded Scale and Machine Company, 2189 South Third Street, Columbus 7, Ohio. Phone: HIckory 4-2186.

FOR SALE—1 New Stedman Type BX 20 x 18 Hammermill equipped with 4 row rotor with ⅞" manganese hammers and complete with 220V reduced voltage type compensator. Mill direct connected to 20 HP, 1200 RPM, 220/440 Volt, 3 Phase, 60 Cycle Totally Enclosed Fan Cooled Motor. Mill and motor mounted on integral base. Box # 20, % Commercial Fertilizer, 75 - 3rd St., N. W. Atlanta 8, Georgia.

FOR SALE: Bemis 3 bucket electro-mechanical open mouthed bagger, Series #6107, contact parts stainless steel, very accurate, available July 1st—$1000. C. Roy Curtis & Sons, Inc., Marion, N. Y.

FOR SALE: 2-7'6" x 55' and 80" x 65' Rotary Dryers, 3 - Louisville 6" x 50' Rotary Steam Tube Dryers, also Mixers, Storage Tanks, Screens, Elevators. Send us your inquiries. BRILL EQUIPMENT COMPANY, 2401 Third Ave., New York 51, N. Y.

FOR SALE: Dewatering Presses, Davenport #1A, #2A, #3A, Louisville 8-roll 36". Aluminum Tanks, 18,000, 3,000 gal. Louisville Rotary Steam Tube Dryers, 6' x 50', Screw Conveyor, Trough Belt Conveyor, Bucket Elevator, Bins, etc. **PERRY EQUIPMENT CORP.,** 1426 N. 6th St., Philadelphia 22, Pa.

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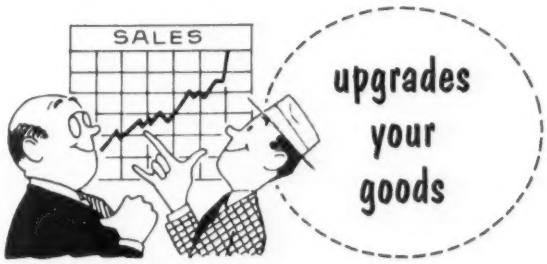

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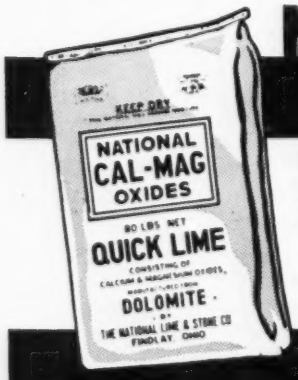
CF Staff—Tabulated TONNAGE REPORTS

FERTILIZER TONNAGE REPORT (in equivalent short tons) Compiled by Cooperative State Control Officials and Tabulated by COMMERCIAL FERTILIZER Staff

	May		April		Jan.-Mar. Qtr.		July-December		January-June		YEAR (July-June)	
STATE	1959	1958	1959	1958	1959	1958	1958	1957	1958	1957	1957-58	1956-57
Alabama	165,927	158,660	313,727	263,953	296,745	246,637	199,265	172,721	734,062	808,901	906,783	983,614
Arkansas	42,602	31,301	95,420	89,621	113,772	75,919	64,092	62,752	226,889	265,235	289,641	325,150
Georgia	471,260	302,211	253,371	262,313	175,273	146,308	294,751	269,529	944,618	980,824	1,214,417	1,234,383
Kentucky	.....	150,713*	130,518	99,166	176,106	139,541	98,504	88,771	435,023	444,107	523,794	534,391
Louisiana	45,057	37,969	56,162	56,239	79,260	67,665	64,152	64,192	232,743	200,277	296,935	271,406
Missouri	.....	151,067*	175,215	133,859	165,375	79,445	370,036	335,312	420,615	460,487	755,927	791,830
N. Carolina	.....	295,452*	464,818	414,140	625,933	438,009	228,055	199,466	1,261,685	1,300,353	1,461,131	1,516,587
Oklahoma	14,374	13,983	15,936	15,766	25,801	20,160	68,848	51,436	55,964	52,836	107,400	107,345
S. Carolina	102,425	102,787	220,685	172,505	385,472	286,778	134,202	116,874	615,733	694,571	732,607	817,500
Tennessee	.....	112,462*	.....	65,668*	150,897	84,114	127,116	135,717	307,182	383,457	442,889	524,638
Texas	83,994	90,118	98,651	100,423	203,084	163,525	222,800	213,801	452,327	392,770	666,128	595,176
California	(reports compiled quarterly)				317,589	253,545	450,767	441,969	679,577	663,484	1,123,235	1,079,748
Oregon	(reports compiled quarterly)				.....	.....	50,176	44,793	132,511	138,926	177,304	201,073
Virginia	(reports compiled quarterly)				315,665	218,551	160,178	140,783	549,773	600,158	690,556	754,233
Indiana	(reports compiled semi-annually)						316,260	284,959	795,506	781,268	1,080,465	1,087,185
New Hampshire	(reports compiled semi-annually)						4,746	3,996	16,053	15,730	20,019	18,983
Washington	(reports compiled semi-annually)						75,350	77,498	158,286	110,242	235,784	165,951
TOTAL	**925,639**	**737,299**	**1,824,503**	**1,607,985**	**3,030,972**	**2,220,197**	**2,830,794**	**2,708,565**	**8,018,547**	**8,293,626**	**10,725,015**	**11,009,193**

..... (not yet reported) * Omitted from column total to allow comparison with same period of current year.



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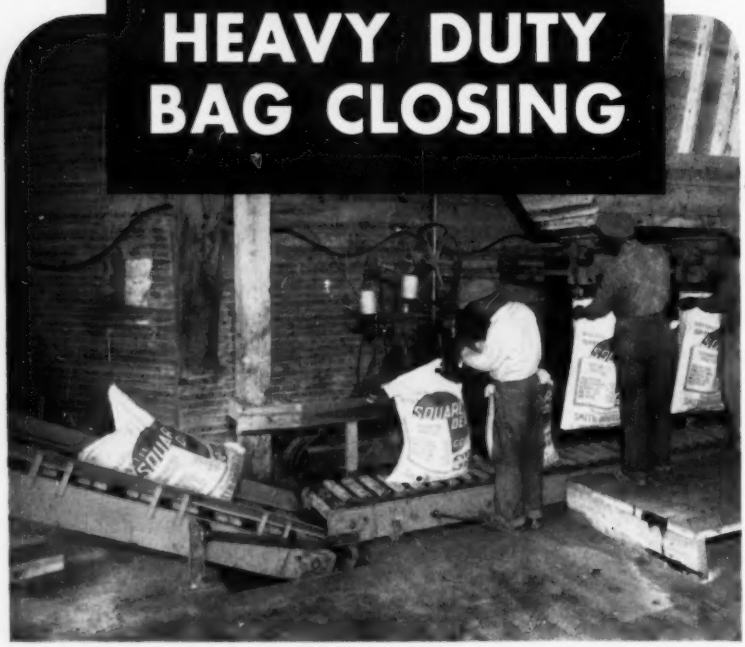

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